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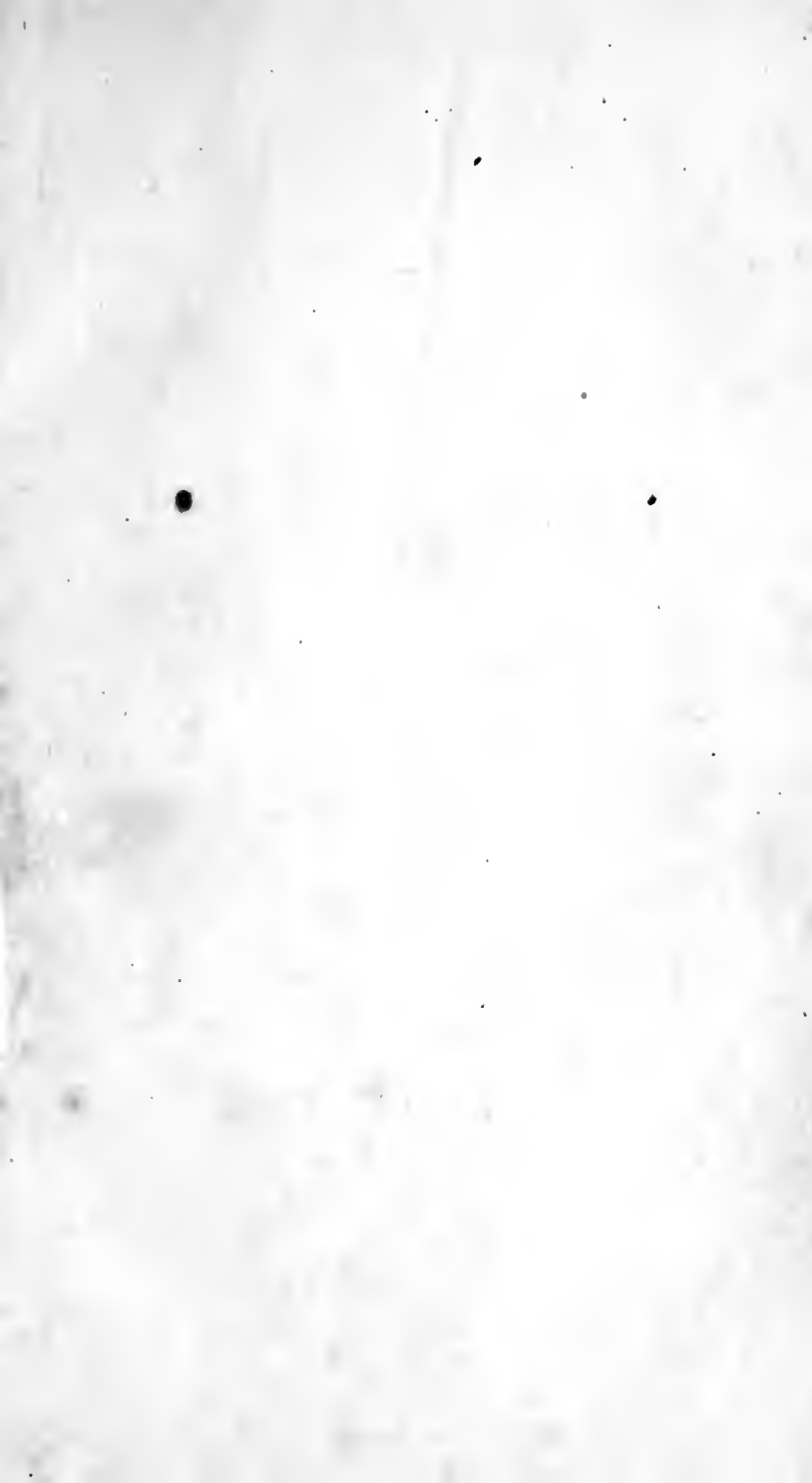
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AGRICULTURE
OF
NORTH-CAROLINA.

PART II:

CONTAINING A STATEMENT OF THE PRINCIPLES OF THE
SCIENCE UPON WHICH THE PRACTICES OF
AGRICULTURE, AS AN ART, ARE
FOUNDED.

BY
EBENEZER EMMONS,
STATE GEOLOGIST.

RALEIGH:
W. W. HOLDEN, PRINTER TO THE STATE.
1860.

THE SECRETARY OF THE ARMY

WASHINGTON, D. C.

My dear Sir,
I have the honor to acknowledge the receipt of your letter of the 10th inst. in relation to the proposed purchase of the land at the mouth of the river, and in reply to inform you that the same has been referred to the proper authorities for their consideration. I am, Sir, very respectfully,
Yours, very truly,
J. M. Smith

Enclosed for you are two copies of a report of the Engineer Department, dated the 1st inst., in relation to the proposed purchase of the land at the mouth of the river. I am, Sir, very respectfully,
Yours, very truly,
J. M. Smith

I am, Sir,

Very respectfully,

J. M. Smith

Enclosed, March 1, 1860.

To His Excellency, JOHN W. ELLIS,

Governor of North-Carolina :

SIR: Although your station in life withheld your hands from the active and laborious duties of husbandry, yet, in the discharge of your former official duties, you were furnished with constant opportunities to acquire exact information of the state and condition of Agriculture throughout the State. It is no doubt for this reason that you have so frequently expressed the strong interest for the improvements in this department of labor, and the more general diffusion of information upon those subjects which are intimately related to it.

By your permission and advice I have been led to undertake the preparation of several works upon the Agriculture of the State. The first is designed to be preparatory to those which will follow, and although the subject matters are by no means easily treated, yet I am encouraged to hope I shall so far succeed as to present them in a form and in a language which can be understood by the common reader.

I am, sir,

Your obedient servant,

EBENEZER EMMONS,

State Geologist.

RALEIGH, *March 1, 1860.*



PREFACE.

THE principles of Agriculture set forth in the following pages are designed for the use of Planters and Farmers of this State. The subjects involving the principles herein detailed, are not so fully treated of as in other works of a higher aim, and which profess to be scientific; but we hope that they belong to a class which may be regarded as the leading principles of Agriculture; and therefore, may secure the attention of those for whom they are designed.

In consequence of the fixed prejudices to change modes of culture, and the strong tendency to unbelief of promised advantages when modifications of a system of husbandry are proposed, it has happened that professional men have taken the lead and advanced forward, when the regular bred farmer has stood still. The lawyer, the physician, and merchant, men of capital, who have been disposed to retire from their professions have been generally more ready to follow new modes of culture, and to engage in somewhat more expensive experiments than the farmer. It is true, their example has not been followed immediately, and indeed, they have not always succeeded; but their results have often been so striking, as to arrest attention, and it has worked in some way or other to the advantage of agriculture; sometimes by exciting the pride or vanity of the regular bred farmer, who feels that he ought not to be outdone or outshone in crops or cattle; and has therefore, been led to attempt on his part to outdo a competitor, who has placed himself irregularly in the ranks of laboring men. By way of illustration, we may mention LIVINGSTON, who introduced *plaster*, by which the agriculture of New York was revolutionized. LIEBIG, a chemist, first prepared and recommended the use of the *superphosphate of lime*, which had a decided influence upon the progress of agriculture. The introduction of fertilizers of this class could not fail to suggest many others, and hence, a multitude of mineral substances have been tried with varied success.

The faithful reader of the following pages may probably observe that certain facts and principles are repeated in different parts of

the work; if so, it will be found that they stand in different relations, and hence, are possessed of a greater value; we are not always losers by repetitions, when we can present them under a new phase. We have prepared this work, because we considered it necessary to carry out the objects of the survey. It is intended to prepare the way for other works which require a knowledge of the facts and principles contained in this. Agriculture is commanding more attention than formerly. Products, which ten years ago were unprofitable, have become profitable, because of the greater facilities and a diminished expense in reaching the markets of the world. Every mile of railroad helps the farmer, as his products are heavy, and are often both heavy and bulky. He requires, therefore, more than any other citizen, *public facilities*. As the world now moves, time is doubly important, and to attempt to reach a distant market with flour, corn or cotton, with the old six horse or mule team, would be utterly ruinous. It was impossible to revive agriculture under the old dynasty, *inaction*; but the advantages of public improvements are now so strongly felt that very few remain to oppose them; the great care which now devolves upon this generation of active and influential men, is to direct them judiciously.

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SURVEY OF NORTH-CAROLINA.

PART II.

AGRICULTURE.

MARCH, 1860.

E. EMMONS.

CHAPTER I.

General remarks. Obstacles which retard the diffusion of knowledge among Farmers. Errors often due to imperfect observations. Case in point relating to acid soils. How experiments to be useful should be conducted.

§ 1. AGRICULTURE is regarded as an art and a science. As an art, its practice comprehends the preparation of the earth for the reception of seed, and the mechanical state best fitted for the perfection of a crop.

As a science, it comprehends that kind of knowledge which relates to the structure and composition of vegetables, their adaptations to climate, soil, and the relation which any members of the kingdom hold to the forces of nature. The successful practice of the art, is more or less dependent upon agricultural science, though in the order of time, art preceded science. This fact may seem to contradict the foregoing assertion, nevertheless its truth may be made to appear from sundry considerations. In the first place, the practice of the art is founded upon the simplest observations when the soil was fresh from the hand of nature and rich in all the elements of growth, when nothing perhaps was required but to gather the fruit and watch the progress of the seasons.

When improvement was attempted more attention was required. The grafting of one kind of fruit upon another must have demanded a knowledge of the structure and functions of bark, stem and the circulation of sap. The success would depend upon a purely scien-

tific conception, which would suggest the proper artistic mode of procedure. Accident must frequently have promoted discoveries, but accident happens in vain to the man who neglects to think, and perceive the real nature of results and how they came to pass. Accident in the presence of GALVANI laid the foundation of the beautiful science of galvanism; the same accident in the presence often or a hundred other men may not have awakened a single idea beyond the naked fact.

Accident, therefore, though it may have done much for science as well as art, yet it is only when it has occurred under the eyes of thinking men; in them alone will be awakened the germ of a practical idea.

It is not to accident however that progress in science or the arts is expected. An unexpected result may and often occurs which is turned to account; still, it is by a train of systematized knowledge that agriculture must depend for its future progress. The more exact this knowledge becomes the more we may hope from its general diffusion.

§ 2. Governed by the foregoing views we have proposed to preface a series of agricultural papers by stating as fully as the nature of the subject demands the elements of scientific and practical agriculture. In former reports, we have not entirely neglected or overlooked this part of the subject, but to add to the value of our agricultural investigations, it seems that something more than a few isolated principles should accompany the reports. The public mind is now awakened to the importance of book knowledge as it has been called. Old prejudices and old practices are giving away, these should be replaced by something more sound or rational, or more in accordance with recently established principles. In agriculture there still remains much that is obscure or has not been satisfactorily explained. When a true reason can be given for modes of successful or unsuccessful culture, agriculture will then have attained its highest stage of perfection. But agriculture requires extensive knowledge, and it will happen when this stage has been reached, that agriculturalists will rank with the most learned of the professions. That it is progressing to such a stage we entertain no doubts; for most of the natural history sciences are constantly contributing their discoveries to this ultimate result. But for results so desirable, time is an essential element, and no one

should expect an immediate fulfilment when so much remains to be discovered and when no doubt, a great deal has yet to be unlearned or must still bear a doubtful import.

§ 3. One of the great obstacles in the way of a general diffusion of agricultural knowledge, especially to the farmer who makes no claim to a scientific education, is the frequent occurrence of hard names or words. A book is often thrown down in despair when so much meets the eye which is unknown. How to get around this difficulty is not yet clear; it is a difficulty which is complained of even by persons who have no just right for complaint. Even a word so common as *ammonia*, perplexes many, and although it is frequently translated *hartshorn*, yet how this pungent vaporous body can play so important a part in husbandry cannot be comprehended. There is certainly a grain or two of common sense in this; for as ammonia is usually spoken of, it would seem unfitting that it should enter the structure of vegetables as *hartshorn*, and that it is hartshorn itself which is so important to vegetation, whereas, it is no such thing; it is only a body which contains a needful element which it furnishes by decomposition. Its properties are due to powers conferred upon the vegetable kingdom. Knowing this body as a powerful stimulant to the sense of smell, does not impart to us a property fitting the sphere it is said to fill. It is so with many other bodies whose names often occur, as sulphuric and nitric acids. Many points relating to these powerful bodies should be more fully explained, and no doubt much of the prejudice of common minds to book knowledge arises from a misapprehension of subjects. How, for example, can a person who has been told that *ammonia* and *nitric acid* or *aqua fortis* are fertilizers, but would at once question the validity of the information. Something more is necessary then, than to be told that certain bodies are fertilizers; they should also know the reason why they are so, and the conditions under which they become so. To understand these points, something must be known of the powers conferred upon the vegetable kingdom, as well as upon the state and condition under which simple or compound bodies become really fertilizers at all. A systematic treatise on husbandry requires that certain elementary facts relating to the origin or source of soils and nutriment of vegetables should be at least generally stated.

§ 4. The importance of established principles as they are considered in the present state of agricultural knowledge, induces us then to state somewhat in detail their practical bearing.

Facts differ from principles. The latter are deductions from the former. It is often the case that what are regarded as facts are imperfect observations. Principles which may be deduced from supposed facts may be, and often are, wrong. When practice is based upon observation, it is quite necessary we should not be mistaken in our facts. We may cite one or two examples of a mistaken theory based upon imperfect observation and an ignorance of the functions which the vegetable kingdom performs. Thus the idea of an injurious acid in the soil is the basis of the application of marl and lime to correct that condition, and the inference is, that the beneficial effects of marling *is due solely to the correction of acidity*. The acidity itself is founded upon the growth of *sheep sorrel, pine and other plants*, which impart the taste of sourness to the palate. Sheep sorrel, however, grows upon poor soil—not upon an acid soil, for it often grows around lime kilns, where it is impossible that an acid should exist at all. We have seen it growing with great vigor through a stratum of air-slacked lime two inches thick, where it had been thrown from a lime kiln. We have seen sheep sorrel also covering a dry hill-side which had become poor by cultivation; whereas, it is rare to see this plant growing in moist peaty grounds, where acids from vegetable decomposition are usually expected. The fact is, in all plants which impart to the palate an acid taste, we may be assured it is *not* due to an acid soil, but to the action of their own peculiar organization, and this acid will be found to exist under any condition in which the plant can be grown. The soil has really no agency in its production; for sow sorrel seed in white pure sand and water, with that which is free from acidity, and the sorrel will be acid; it is characteristic of the plant, and independent of the soil in which it grows. Yet marl is useful, though our notions of its action are erroneous; still the question is highly practical; it would govern our practice in the quantity to be used; for if it is merely wanted to correct acidity, a small quantity will suffice for that. Whereas, if it is maintained that it furnished directly or indirectly food to the crop, a much greater quantity will be required.

§ 5. Another instance of an erroneous view of the operation of lime was related a few years ago at an agricultural meeting by the President of a State Agricultural Society. He said, he had used lime on two different kinds of soil. 1st. On a sandy soil, and at a certain amount per acre. He could not discover the slightest beneficial effects. He therefore concluded lime was good for nothing for sandy soils. He then tried it upon a clay soil. This experiment too was a failure, as he could not perceive that his crop was increased in amount. His general conclusion, therefore, was that the benefits of lime had been greatly overrated.

Now both conclusions were erroneous, because all the facts of the case had not been investigated. In the first instance the conclusion that the crop upon the sand was not improved by lime was true, but it does not follow that lime upon sandy soils is always useless, that contradicts the equally good experience of others. The fact was, the sandy soil was in a great measure destitute of organic matter, and hence the failure. We do not stop now to state the reason in greater detail; this subject will be considered fully hereafter. In the second instance, the clay soil, the conclusion that the crop did not appear to be benefitted by marl was no doubt true, but the speaker appears not to have at all apprehended the cause; it was not because it was a clay soil, but because there was already enough lime in the clay, there being not less than five per cent. We find, therefore, that the result of simple experiment, though made by the President of an Agricultural Society, may entirely mislead a community when all the associated facts are ignored. It turns out that lime is a fertilizer only upon certain conditions; those conditions must be complied with. Where it already exists in the soil to a large amount, it can only be useful in a caustic state. In this condition it affects both the chemical and mechanical condition, but is not necessary to form certain combinations by which a fertilizing substance is, as it were, generated or in part formed.

Experiments then, to be useful, must be conducted with a knowledge of all the essential points which bear upon the results obtained. The nature of the soil must be understood—the general composition of the fertilizers employed. In other words the experimenter must know what he is about.

CHAPTER II.

The difficulty of classifying soils systematically. Varieties of soils. Soil elements. Derivation. Composition of rocks which furnish soils. Weight of soils. Average quantity of silex in soils. Carbonate of lime in soils. Losses which soils sustain in cultivation well established. Temperature an essential element in productive soils. Soils of the Southern States remain *in situ*. Organic elements of soils. Inorganic elements, etc.

§ 6. Soils cannot be systematically classified. We may divide them so that, considered in the extreme, the strong lines of demarkation will appear quite distinct, as a clay soil and a sandy one, but these graduate into each other and the lines of demarkation disappear insensibly. So we find peaty soils, and in districts where chalk underlies the surface soil, we may distinguish a calcareous soil, but both kinds lose their characteristics by intermixtures of clay and sand. We may however, say with truth, of any particular locality, that it has an argillaceous, calcareous or sandy soil as the case may be. Such a statement should be made, but this does not amount to a classification. We shall not, therefore, attempt the arrangement of soils into a systematic classification; it will be sufficient to indicate in our nomenclature the predominant element, whether it is clay, sand, lime or vegetable matter. It is not, however, proper to omit the statement that sand or silex is the basis of all soils except those in which organic matter greatly preponderates, for, in clay soils silex still exceeds in quantity the clay, but still clay masks the silex, though it is less than one-half, and hence has to be treated as an argillaceous soil.

But the real nature of soil is not fully stated, by any means when they are merely referred *generally* to the preponderating element, there is left out of view certain elements which, so far as fertility is concerned, are quite as important, though they exist only in minute proportions. We shall, however, take the ground that all the elements of a soil are important, and take away entirely any one of them and its fertility will be affected for certain crops at least, if not for all.

§ 7. The soil elements are only few, when compared with the number of known simple bodies; thus, while the known elements amount to about sixty-two or three, only about thirteen or fourteen

play any considerable part for the benefit of the vegetable kingdom. The latter are embraced in the following list, viz: Oxygen, hydrogen, nitrogen, sulphur, carbon, phosphorus, the base of silex, or silicon potash, soda, lime, magnesia, clay or alumine, iron and manganese. Iodine and chlorine also exist in plants and soils. Potash, soda, lime, magnesia are compounds of oxygen and a metal, whose names terminate in *um*—as potassium, sodium, calcium, &c. The first seven which stand in the list, are unmetallic bodies, the last seven are metals. Oxygen, hydrogen and nitrogen in their free or uncombined states, are aeriform bodies; the others are solids possessing different weights. The foregoing bodies or elements exist in the rocks which compose the earth's crust, not however as simple bodies, but in combination with each other, forming what are usually known as simple minerals. Thus, quartz, mica, felspar, hornblende, talc, serpentine, carbonate of lime consist of these elements, and furnish them when they decompose or disintegrate into soil. The foregoing minerals constitute the great mass of the earth's crust. To take an example of the number of elements which a simple mineral as hornblende furnishes may be seen by the results of analysis. Thus hornblende, felspar and serpentine are composed of

	HOENBLENDE.	FELSPAR.	SERPENTINE.
Silex,	45.69	66.75	43.07
Alumine,	12.18	17.50	0.25
Lime,	13.83	1.25	0.50
Potash and Soda, .....	.....	12.00	12.75
Magnesia,	18.79	.....	40.37
Oxide of Iron and Manganese,	7.32	0.75	1.11

A simple or homogeneous substance, therefore, furnishes many soil elements, and as rocks, such as granite, gneiss, mica slate, hornblende, are made up of several minerals in mixture, or are aggregates, we may see how a single rock furnishes all the essential elements of nutrition.

The rocks which are composed usually of simple minerals, yield one or two elements in excess: silex and alumine, and hence these necessarily predominate in most soils. Almost all of these minerals furnish other bodies in minute doses, potash, and soda, together with combinations of lime and silex, potash and soda with phosphoric acid.

The latter forms such small proportions that they were at one time set down as accidental and unessential soil elements, but now they are known to be all-important.

§ 8. The mechanical condition and weight of any soil depends upon the existence of the predominating element. Sandy soils have a loose porons texture while an argilaceous one has a close one, and may be impervious to water.

The weight of soils is dependent of course upon composition :

A cubic foot of dry silicious soil weighs,*	111.3 pounds,
A sandy clay,	97.8
Calcareous sand,	113.6
Loamy clay,	88.5
Stiff clay,	80.3
Slaty marl,	112.
A soil richly charged with vegetable mould,	68.7
Common arable soil,	84.5

The average weight is about 94.58, and when charged with water will weigh 126.6 pounds.

§ 9. Soils which are formed from the debris of rocks, contain a large though variable proportion of sand and silex. Of one hundred and forty-six soils of Massachusetts, the average quantity of silex is 71.733. This is insoluble matter. The soluble and that which is fitted ultimately to enter into the composition of vegetables is about 15 per cent., of which 2.075 is a salt of lime. The midland counties of N. Carolina furnish coincident results. But the eastern counties, which have extensive tracts of swamp lands, differ considerably from the foregoing. The silex and alumine in many large tracts, amounts to less than 50 per cent., and sometimes is even less than five, or indeed must be classed as a peat unsuitable to cultivation.

Of lime, which is so much talked about, and is truly an essential element in soil, it appears from hundreds of analyses, that it rarely exists in large proportions. Such is the case in the soils of New York, even where they overlie a limestone, its average quantity rarely exceeds one per cent., and in large tracts it scarcely comes

* Dana's Muck Manual, p. 36.

up to one-half of one per cent. In the western States there is about 1.50 per cent. In 48 European soils, noticed by Dana, it is 1.860. European soils agree generally with American; all things, therefore, being equal, their treatment with fertilizers will be based upon similar rules. We must not, however, disregard the influence of climate and temperature. These are important elements in agriculture, but so far as the composition of the soils of all the great geographical divisions are concerned, their differences have arisen from cultivation mainly; in their natural state they were much alike.

§ 10. Soils are analyzed for the purpose of determining their constituents. Under long cultivation some of the important elements are so much diminished that fertility cannot be claimed for them. We shall show hereafter how soils become infertile, and what becomes of the fertilizing matter. The proof that soils actually part with certain elements essential to fertility has been fully ascertained and determined. This result is certainly due to chemistry, and it is a great result; for, for a long time the contrary was maintained, and even now many believe that by a rotation of crops and good manipulation, soils may be maintained for an indefinite period in a state of productiveness. So, also, it has been believed, and is still in quarters, that lands thrown out to commons, or to remain a few years fallow, will recover their original fertility. The sooner, however, such opinions are abandoned the better, as they lead to an erroneous system of agriculture.

A destructive practice really grew out of the doctrine, it was the continued use of the axe and fire, followed by long fallows when exhaustion was nearly completed. It demanded extensive plantations, and had such a system of extermination of timber been followed in a more northerly clime, the loss of wood and timber would have become a severe calamity.

§ 11. I have observed that temperature independent of the composition of soil is an essential element in agricultural practice. It often determines the kind of crop as well as the season when it is to be planted. In England maize finds an incompatible climate, and hence, as a substitute for grain wherewith to fatten cattle, root crops as the turnip is resorted to. Maize germinates in a soil when its temperature is as low as 60°, and also when it rises to 105. Germination is however arrested when the temperature reaches 116–120. In tropical regions the order of things is somewhat changed.

So much heat exists in the period answering to our summer that wheat, barley and oats are sown in the coolest months. So in mountainous regions, temperature becomes the controlling element. In the latitude of the Swiss Alps in Europe, wheat ceases to germinate at 3400 feet which corresponds to the latitude of 64° .

Oats, at 2500, corresponding to latitude, 64°

Rye, at 4600, corresponding to latitude, 67°

Barley, 4800, corresponding to latitude, 70°

In Northern New York at the height of 2000 feet above the ocean, wheat is an uncertain crop, or is liable to be cut off by an early frost; while oats, barley and rye come to maturity. So far as these facts go, it appears that the solid masses of the globe as the rocks, have little influence upon crops; but at the same time cultivation never fails to produce its influence, that of impoverishing the soil.

I have shown in a former report that the soils of the Southern States are not only formed from the rocks of the country, but that they remain upon the place where they are formed or *in situ*. The proof may be found in every railroad cutting from Virginia to Alabama. Wherever a quartz vein penetrated the rock it remains unchanged in position, it presents the interesting and curious phenomenon of an irregular band which seems now to have been forced through yielding and soft materials. Quartz veins standing up for 20 feet unsupported except by soft yielding materials. It is rare to see any thing of the kind in New York or New England. There, at some former period such soft materials with their veins of quartz were swept off by a mighty flood of waters. This erosion no doubt extended deeply or down to the solid plane of rock. No flood however, has disturbed the debris of rocks in North-Carolina, and hence it is no doubt true that this debris is really one of the most ancient products of the globe, equaling in age the Silurian or Devonian systems; still there is no clue by which its age can be exactly determined, it is now a soil often 25 to 50 feet deep. This condition of the soil no doubt has some important influence upon its agricultural capabilities. The plough in many places must continue to bring up for years an unexhausted soil where the mass is penetrable. This new soil turned up by deep ploughing, however, is necessarily coarse, especially where it is derived from the coarse schists, as gneiss and mica slate, hence it requires before it is really

prepared to receive a crop to be exposed to the chemical influence of the air and the action of frosts whose effects are mainly to increase its fineness.

§ 12. Simple bodies enumerated in a foregoing paragraph seem to require a fuller notice, particularly as to their properties or functions as soil elements. When either of them is isolated they appear to be neutral bodies; that is, they manifest but little disposition to form combinations. Nitrogen and hydrogen would remain in contact with each other for ages without entering into combination. Oxygen and hydrogen never combine when confined together in a vessel. A force is necessary to effect it in either case. A flame however, unites them suddenly, attended with a violent explosion. When burnt in streams issuing from small orifices, they combine evolving great heat and intense light. The product of combination is water, and nothing else. Most bodies have a strong affinity for oxygen; and hence, it is an element common to most solids. The air or atmosphere is composed of oxygen and nitrogen, water, of oxygen and hydrogen, iron rust of iron and oxygen; potash, of oxygen and potassium; soda, of oxygen and sodium; lime, of oxygen and calcium. The general term for compounds of the metals with oxygen is, **oxide*, as oxide of iron, manganese, lead, copper, &c. Oxygen when isolated is always aeriform; and has never been condensed into a solid or liquid. It is the essential element in combustion as usually understood, and is the only body capable of supporting life by respiration. When the word oxygen occurs we can scarcely fail to be reminded of its agency in sustaining life, and for supporting combustion. From these two facts, we may proceed farther, and call to mind that it forms a great class of bodies, called *oxides*. Neither can we fail to consider that it changes the condition of all bodies with which it unites. Water is unlike oxygen or hydrogen. Oxide of iron has no property in common with either of its elements.

§ 13. HYDROGEN, is the lightest body known, and is always aeriform except when in combination. It has neither taste or smell,

* The word oxide, properly terminates in *ide* and not *yde*, because in framing the nomenclature, this termination was fixed upon; according to idiom it would be spelt *oxyde*.

and is never found in nature uncombined with other bodies. Although it exists in many bodies as oils, and those which are termed *organic*, yet water is the body in which it most abounds—not that its proportion is greatest in water, but the general diffusion of water over the globe and in most bodies, makes it the great source of this element.

§ 14. NITROGEN, is another aeriform body, neutral and of little power; it would seem almost destitute of affinity, for other bodies, if we judge of its properties as it exists in the atmosphere. Indeed, though it has feeble affinities, it is for that reason, an element of one of the most powerfully corrosive bodies known. Nitric acid for example is only oxygen and nitrogen, but who ventures to taste it the second time, notwithstanding we inhale the elements of nitric acid at every breath. What substance is more singular than ammonia, or hartshorn, which is only nitrogen and hydrogen chemically combined. It will be seen in the sequel that nitrogen performs important functions in the soil.

§ 15. CARBON, is a solid. We feel relieved when a solid presents itself, something to be seen and handled. It is pure in the diamond; nearly so in anthracite coal, and in the purest charcoal. It has only a feeble disposition to combine with other bodies. Heat materially puts its particles in a combining state. It forms with oxygen, carbonic acid, an aeriform body sufficiently heavy to be poured from a tumbler. If poured upon flame it extinguishes it, showing that though one of its elements is a combustible and the other a supporter of it, that it is itself an extinguisher when applied to burning bodies, and hence has been and may be used to extinguish fires—when inhaled, it acts as poison to the system; and yet in all organic bodies it is a basis of support.

§ 17. The four preceding elements are often called by way of distinction, the organic elements of bodies; because all bodies which are organized are composed mainly of them. The following examples will show more clearly than any other statement, the fact alluded to. For example, hay, in 1,000 pounds, is composed of:

	LBS.
Carbon,	458
Hydrogen,	50
Oxygen,	337
Nitrogen,	15

in which is found 90 pounds of inorganic matter called ash, the product of combustion. Potatoes is composed of:

	LBS.
Carbon,	440
Hydrogen,	58
Oxygen,	447
Nitrogen,	15, Ash 40 lbs.

Oats is composed of:

Carbon,	507
Hydrogen,	64
Oxygen,	367
Nitrogen,	22, Ash 40 lbs.

Wheat is composed of:

Carbon,	461
Hydrogen,	58
Oxygen,	434
Nitrogen,	23, Ash 24 lbs.

The constituents of animal bodies are quite different, though the same elements are usually found. Thus in lean beef blood, white of eggs, there is found:

Carbon,	55 per cent.
Hydrogen,	7
Nitrogen,	16
Oxygen,	22

The propriety, therefore, of calling these four elements organic is not improper; it is true, however, that inorganic matter is always present. It seems to be necessary wherewith to form a species of skeleton, especially in such bodies as hay, oats, and wheat. In animal bodies, as hair and wool, sulphur is an important element, as well as phosphorus. In the solid structures, as bone, phosphorus, an element of the mineral kingdom, is always present in the largest proportion.

All good soils have their organic parts. When, therefore, the organic constituent of a soil is referred to, we are necessarily re-

mind of the fact that it consists of these four elements, carbon, oxygen, hydrogen and nitrogen, or that it may be resolved into them.

It is not to be concealed, however, that there are numerous bodies belonging to the organic kingdoms in which nitrogen is absent, as starch, gum, sugar, and the essential oils.

§ 18. SULPHUR is a well known substance, of a yellow color, and a faint, peculiar odor. It burns with a pale blue flame, giving off at the same time a pungent suffocating vapor, which consists of oxygen and sulphur in combination. One pound of sulphur will make three pounds of sulphuric acid, or oil of vitrol. Sulphur is present in many substances. Mustard seed contains it in a large proportion; it is also always present in eggs, and which in consequence blackens silver; in wheat it is present, particularly in its gluten; also in lean meat, and in hair and wool, in which it forms nearly one-twentieth of their weight. From its constancy in the vegetable and animal kingdoms, it might be inferred that its application to the soil would be attended with favorable results. It is however, a striking example, illustrating numerous other cases, that in a simple condition it is not at all fitted to fulfil the office of a fertilizer, although it is not entirely insoluble in water. It may be used, however, beneficially in its simple state for the purpose of protecting vegetables from the attack of insects, as turnips, cabbages, &c.

But the sulphur of organic bodies, as hair, wool, mustard seed, is derived from salts which contain it; gypsum furnishes it; and other sulphates, as the sulphate of soda (glauber salts) sulphate of ammonia, etc. In this fact we find an illustration of the power of organic bodies to appropriate elements which are locked up in chemical combinations. Nothing is created in the vegetable tissue; it is only possible for it to decompose and appropriate such bodies as they require in growth, and each organ performs an independent office, and takes only that which its constitution demands. Thus the chaff of wheat differs in composition from the enclosed grain; and the hair differs in composition from the skin, upon which it is supported.

§ 19. PHOSPHORUS is a yellowish, waxy substance, extremely inflammable, and even consumes at the ordinary temperature, but does not burst into a flame except its temperature is slightly ele-

vated. Friction upon a rough board sets it on fire. The common lucifer match is a good illustration of the fact, and the vapor given off in the act of combustion is composed of oxygen and phosphorus.

It is generally diffused in the organic kingdoms; in certain parts, as bones, it is far more abundant than sulphur in other tissues. It is contained in the substance of brain. Wherever a compound word, as *phosphate of lime*, phosphate of soda, etc. occurs, they will at once suggest to the mind of the farmer the combustible substance, *phosphorus*, or it may be the *lucifer match*; but as in the case of *sulphur*, the simple body *phosphorus* cannot be employed directly as a fertilizer. Combinations of it must first be formed with oxygen, and then the acid thus formed must combine again with bodies which are called bases, as lime and potash. These form the base with which a *salt* is the final result. In the condition of a salt then, which is a body composed of an acid and a base, both sulphur and phosphorus are brought into a condition in which they may be employed as fertilizers. The composition of the salt is indicated by its name. Sulphate of lime, phosphate of lime, nitrate of lime, the latter indicating the presence of *nitrogen*, and by going back a step, it will be understood that nitric acid is implied, a compound of nitrogen and oxygen.

§ 20. The simple minerals from which soils are mainly derived, are felspar, hornblende and trap mica serpentine, talc, carbonate of lime. Their composition which has been given shows what elements they respectively furnish for the soil. Sillex, which we find in the condition of sand, is a common product even of serpentine. But of the others we find felspar furnishes potash and soda, and one kind of felspar furnishes lime. Serpentine and talc abounds in magnesia, and so, also, certain kinds of limestone, particularly those called dolomites. Hornblende furnishes lime and but a trace of potash or soda. Hornblende is, however, generally of a dark green color, a color which is mainly due to iron, and hence soils derived from hornblende and trap, which is also dark colored, are generally red, for the reason that the iron when set free from its combinations, takes more oxygen and forms thereby a red peroxide of iron. When we find a soil derived thus from hornblende, and knowing also the composition of the mineral, we safely infer that the soil will contain a sufficiency of lime. A felspar soil is often gray, but

when iron is present in one or more of the elements of granite, it will change to a red which indicates a better soil than the gray. Granite soils are often very silicious, in which case they are coarse and poor or meagre in consequence of the great excess of quartz in the granite. The granite soils of North-Carolina, however, are generally very good, or are less meagre than in many other parts of the United States. Where felspar and mica predominate over the quartz element in granite, the soil resembles an hornblende soil in color, and in composition we may expect a larger per centage of potash.

Hence we obtain approximately several important facts relative to the composition of a soil when we have ascertained its origin. It will appear also, that this information may be obtained with greater exactitude in the Southern than in the Northern or Western States, where the soil has been transported to a distance from its parent bed.

§ 21. It has been stated that the original source of nutriment for the vegetable and animal kingdoms may be traced back to the rocks and minerals; it is still required that we also show as correctly as possible how the seemingly insoluble debris of the globe's crust becomes food, or is fitted for its high and important function. The fact itself is based on observation and experiment. For example, the process of disintegration goes on under our eyes. We see rocks crumbling to a coarse powder which becomes by the continuance of atmospheric action still finer. If in any stage the composition of the rock is determined by analysis, it is found to consist of similar elements. But still the debris may and often does lose a portion of the mass, by solution. Granite contains in its felspar, potash or soda; both substances are finally washed out by water, or are perfectly set free from their combinations, and become soluble matters in the soil under other chemical states: those for example, which are called organic salts of potash or soda. We are required to look upon all the solid parts of the earth as in a state of change; every particle is in motion, nothing at rest. Some compounds it is true, are much more stable than others. Quartz for example, when unmixed with other bodies, appears to us stable. But felspar and mica are constantly undergoing change. The same may be said of hornblende, trap, mica, serpentine, talc, carb. of lime, etc. A double change is in progress. 1st, the mass is mechanically divided; and

2d. It is changed chemically. A piece of felspar, hornblende, or trap splits into thousands of particles. The surface is thereby greatly increased. In this condition the carbonic acid of the atmosphere acts upon its potash. This aids greatly in breaking up the affinities between the silix and alumine, and the consequence is that in the masses the silix chrystallizes out; the bond that united all the elements of felspar and formed an homogeneous mass is broken. In the original compound as felspar, the mineral was a silicate of alumine and potash, soda or lime, but carbonic acid having combined with one of the alkalies and formed a carbonate instead of a silicate, both the silix and alumina are set free, and the particles of silix will come together, and those of the alumine also. In the first mineral we perceive the grains of quartz or flint, and in the latter the pure clay. Molecular force, as it is called, brings together like particles. Under the operation of these molecular forces, felspar will not be reformed, though all the elements are present at one time; but in process of time all the carbonate of potash is dissolved out. An ultimate result which is quite obvious from inspection of beds of decomposing granite is the finding of a pure white bed of clay, called porcelain clay, intermixed with fragments of quartz, together with nodules of flint, as they would be called, and which are often hollow and their interior lined with fine crystals of quartz. The nodules are derived from the silix of the felspar, which was in combination with the alumine and potash. In this condition we see a perfect change of state. Analogous changes are in progress all the time.

§ 22. From the foregoing it may be seen that lime, potash, soda, silix, etc., are originally rock constituents, which by a process of decay become parts of the soil, and thereby accessible to the roots of plants. So also sulphur and phosphorus belong to the common compounds of the earth's crust. The first is extremely abundant in a class of bodies called *sulphates* or *sulphides*; combinations of metals with sulphur, as sulphuret of iron, so generally diffused in nature. It is known to be present by heating the body, when the peculiar bluish flame appears, accompanied with the suffocating odor of sulphur. Phosphorus, though less common, is probably always diffused through granite, but it is known to be more constant and more abundant in that class of rocks, called *trap*, in which also potash and other alkalies are constituents. Hence, as

trap, when it decomposes, furnishes an aluminous basis for a soil, and is at the same time impregnated with sulphur, phosphorus, and the alkalies, their soils are eminently adapted to the wheat crop. The gluten of wheat requires sulphur and phosphorus, as well as potash in certain combinations.

The organic constituents of the soil exist also as mineral bodies in the soils, and also rocks; oxygen in combination with all the elements of soil, hydrogen in water, and nitrogen in the nitrates, and the atmosphere diffused in the soil, where it is an active body, ever ready to form ammonia with hydrogen when water is decomposed.

§ 23. A substance which is not simple requires in this place a further notice, because its office is an important one in the vegetable economy; it is carbonic acid. The atmosphere is regarded as its source. It is, however, generated in the soil. Its solvent properties are among its most important properties. It is, notwithstanding, a feeble acid, and a feeble solvent, water charged with it dissolves rocks, and the indispensable compound, *phosphate of lime*, is dissolved by it, and being thereby brought into a soluble state by water, it becomes accessible to the roots of plants when diffused in this menstruum. In the atmosphere it forms only one two-thousandth part. It is maintained that leaves absorb it from the atmosphere, and obtain thereby the carbon required to build structures. Still, water in the soil holds it in solution, and from this source it is furnished in a direct way to the vegetable. It is also furnished to growing plants by peat, and the changes which organic matter undergoes in the soil; there is, therefore, an aerial source from which the leaves or upper structures of plants obtain it, and a sub-aerial source from whence the vegetable gets it by the roots. The latter are the channels by which the former may feed it to his growing crop. The organic part of the plant, that in which carbon is so abundant, is that which is consumed in combustion. The products are all volatile, and hence, are dissipated. It is by far the heaviest and most bulky part of the vegetable. That which is left after combustion is the inorganic part, and consists of lime, silex, potash, magnesia, soda, iron, etc.

CHAPTER III.

The organic part of a soil and variety of names under which it is known, changes which it undergoes, and the formation of new bodies by the absorption of oxygen. Fertilizers in North-Carolina. Green crops. Mutual action of the elements of soils upon each other. Composition of one or two of the chemical products of soils showing the source of carbon in the plant.

§ 24. The organic part of a soil consist apparently of carbonaceous matter, and taken as a whole, it is the brown or blackish part, and which is consumed when ignited. Its appearance, indeed, is due to a species of combustion which is carried just far enough to char the vegetable matter. In warm climates it is nearly all consumed, while in cold it constantly accumulates, and forms at the surface a coat of blackish mould. The term organic applies to this part of the soil. On the mountains of this State it is often more than a foot thick. In the swamps of the eastern counties it is often ten feet thick, while in the midland counties it is only sufficient to give a brown stain to the surface. It does not seem to accumulate in consequence of a slow combustion, or as it may be termed *decay* which takes place.

In common language, the organic part is known under a variety of names, as *humus*, *mould*, *vegetable mould*. It is, however, a complex substance, and is constantly undergoing changes which promote vegetation. Chemists have obtained several distinct substances from it. It is really a mixture of organic and inorganic bodies. A portion of the organic matter is free, that is, it is uncombined with the inorganic part. Other parts are in combination with lime, magnesia, iron, potash, soda, &c. The latter are soluble, and also fertilizing matters, and play an important part in vegetation. The cause of this intermixture of organic and inorganic matter is to be traced to its origin. Thus, organic matter being the debris of the vegetables which had grown upon the soil, it must necessarily contain also the inorganic part which belonged to the living vegetables. From this fact it may be inferred that this matter is, in the proper proportions, to be employed by any subsequent crop.

§ 25. VEGETABLE MATTER after death passes through a series of chemical changes, which gives origin to the numerous compounds

found in organic matter. These changes are due mainly to the absorption of oxygen. The first substance formed from woody fibre after the death of the plant, is *ulmic acid*. Another portion of oxygen changes ulmic acid into *humic acid*; and the last is changed into *geic acid*; on a farther oxydation it passes into *crenic acid*; and finally by the same process into *apocrenic acid*. In an old soil, all these bodies exist simultaneously. The most important, or those which are immediately active, are the three last, geic acid, crenic and apocrenic acid. All the foregoing bodies are the products of the decay of plants, when exposed in the soil to air and moisture. They cannot be distinguished by sight, and the whole mass is simply a homogeneous brown substance. But it is richly charged with the elements of fertility.

We may omit the details respecting the chemical constitution of these bodies. It will be sufficient to state in this place, that they are feeble acids; and yet possess considerable affinity for inorganic matter, lime, magnesia, ammonia, potash, soda, iron, etc.; so much so as to combine and form with them *salts*, which are at once in the proper state to be received as nutriment into the tissue of growing vegetables. This organic matter, however, is remarkable for its affinity for ammonia; the result, therefore, is that this important substance may be detected in vegetable mould, though it may be chemically uncombined with the foregoing acids; it may be present as a mixture, yet being present, it will be disposed and ready to combine with the crenic and apocrenic acids, in both of which nitrogen may be always detected. Organic salts, formed by the union of organic acids, with lime, magnesia, potash, ammonia, etc., are the proper food for plants; and hence, it will be a maxim with the farmer to take such measures as the nature of those substances require to increase it upon all occasions which occur. The greater the amount of these salts in his soil, the greater his crops.

§ 26. From the foregoing statements we may deduce the following principle, that *there is a mutual action of the organic and inorganic parts of the soil upon each other, and that to this action fertility is, in a great measure, due.*

In order that these mutual actions may be better understood, we proceed farther and state, that those substances which are called silicates, have but a slight if any tendency to act upon each other. They are, however, gradually decomposed by carbonic acid, the

effect of which is to form with the base of the silicate a carbonate. Thus in the case of granite and similar compounds, the felspar and mica which are silicates, are slowly decomposed, and the alkali, as potash, or alkaline earths, as lime and magnesia, or even iron and manganese of the rock, lose their silica, or are disengaged therefrom; and the carbonic acid combines with them. These being soluble compounds, are liable to be washed out and carried to the sea, while the insoluble silicate of alumina, or its pure form, remains behind. The consequence of this is, that the soil is relatively richer in clay than before, and the longer the chemical changes are going on, the larger the quantity of clay in the soil; and it is agreeable to experience that soils become stiffer by cultivation. By this process they become less adapted in the course of time to certain crops in consequence of this change of constitution. Large districts which once grew the peach luxuriantly, seem to have lost in part the power or ability, or, at any rate, the peach tree does not thrive so well in the oldest districts of New York and New England, as it did in the early period of their settlement. It is not possible probably to be satisfied fully with respect to the cause why the peach is cultivated with difficulty, but the fact that the soil by cultivation becomes more close and compact, may be remotely connected with the change we have stated. It has been attributed to a change of climate, but it is not true that the climate has changed, and hence we are disposed to refer the change in question to a change in the soil.

§ 27. In North-Carolina the natural supply of fertilizers exists in the marls of the lower counties, together with the organic matter of the swamps and bogs. The two exist often in juxtaposition. Experience has proved that marl applied to exhausted lands is often injurious. Now this exhaustion extends to the organic matter, though it also exists in its inorganic also. But experience further proves, that however large a quantity of the latter is applied, little benefit is secured so long as the first deficiency exists. We may see the reason why no organic salts can be formed in the absence of organic matter. The inorganic matter cannot find the proper elements with which to combine, and which the constitution of the vegetable requires. The practical inference is, that marls should be composted with organic matter, as leaves, straw, and weeds, which are free from seeds, or anything which has lived. Or, an-

other plan may be pursued—supply the organic matter from a green crop, as a crop of peas, ploughed in. In certain parts of the State, clover or buck-wheat may be resorted to. The gain arising from the latter practice, arises from the ability of these crops to take from the atmosphere the organic elements, and deliver them to the soil, a process over which the planter or farmer has no control, except the institution of means. Under many circumstances, the organic matter may be supplied more cheaply by sowing seed than by composting.

The importance of organic matter in soils has been sustained by the experience of ages; but there was a time when this point was denied by the ablest Chemists of the age. It was maintained, that the ash or the inorganic part gave to the soil all that was important, and hence certain practices were recommended which were in accordance with this theory, such as burning manures, burning turf and the like. Happily, this question has been set at rest, and the best Chemists admit those views which the experience of ages has confirmed independently of chemistry.

§ 28. But the point which bears more immediately upon the principle respecting mutual actions, comes in play subsequently to the decomposition of the silicates; which, so far as inorganic matter is concerned, are inert; but the lime and alkalies once freed from their original combinations with silica, becomes fitted to act at once upon organic matter, and form with it salts. This decomposition may take place where no organic matter exists by the carbonic acid of the atmosphere, but it happens that organic compounds furnish also carbonic acid to the soil; for it is displaced when carbonate of lime or potash is acted upon by an organic salt. Crenic acid, acting upon carbonate of lime, sets free the carbonic acid, and this, in its turn, acts upon the silicates to decompose them, and thereby sets the alkalies and alkaline earth also free. There is then a double mutual action, as it were, constantly going on in the soil, by which nutriment is furnished to the crop. Some physiologists maintain that the *presence of a living body*, as the root of a growing plant, effects decomposition similar to the action of sulphuric acid in converting starch into sugar. However this may be we are inclined to believe that the root has power to act and effect changes upon the elements of soil which are unknown in the laboratory of the chemist; and many substances which are insol-

ble by chemical agencies, become soluble by the action of the roots of vegetables.

§ 29. The foregoing facts and principle do not change at all the action of the farmer; they go to sustain his practice in providing fertilizers by means of composts, formed by mixing the organic and inorganic bodies together, and for the purpose of giving them time and opportunity to effect those chemical changes, of which we have spoken. These never fail, while fertilizers in other states do. The foregoing are some of the chemical changes which take place in the soil, and which are mostly due to the presence of organic matter. All the facts go to prove the importance of organic matter, and the necessity, therefore, to supply it when from any cause it is wanting or deficient in quantity.

§ 30. In addition to the lime and other mineral bodies which the organic salts furnish to plants, it is plain that *carbon* is also one of the elements supplied. To make this plain we annex the composition of one or two of these organic bodies. Humate of ammonia consists of:

Carbon,	64.75
Hydrogen,	5.06
Oxygen,	26.22
Nitrogen,	3.97

Humate of ammonia, it will be perceived, contains more than half its weight of *carbon*, which may be taken up in the circulating sap.

Humic acid is composed of:

Carbon,	65.30
Hydrogen,	4.23
Oxygen,	26.82

It will follow, from the foregoing, that carbon, which forms the largest part of a vegetable, is not derived entirely from the atmosphere. The soil, through the medium of the roots of the plant, furnishes at least a part of this essential element. In certain plants, as wheat, rye and oats, it is very possible that all the carbon is derived from the soil; while in beans, clover, lucerne, etc., a large proportion may be derived from the atmosphere.

CHAPTER IV.

The mechanical condition of soils differ. Circulation of water in the soil with its saline matter. Capability of bearing drouth. How to escape from the effects of drouth. Temperature of soils. Influenced by color. Weight of soils, etc.

§ 31. The mechanical or physical conditions of soils differ according to their composition, and these physical differences must not be disregarded. It is well known that a clay soil contains under ordinary circumstances, more water than a mixture of clay and sand, and much more than sand alone. This fact may or may not become a serious injury to growing crops. It will depend upon the season. If it is very wet serious injury may be expected, or if it is very dry the crop will suffer, but not in the same way. All surfaces, whether composed of clay or sand, become dry by the evaporation of water, and the evaporation not only effects the surface but extends to a great depth; water seems to rise up to the surface from beneath to supply the waste. In confirmation of this view it is not uncommon to find a saline matter upon the surface in dry weather, which has been in solution in the water brought to the surface by this process. In many places in Wake county, N. C., the naked soil in ditches is covered with an incrustation of sulphates or iron and alumine, an astringent salt injurious to vegetation. This incrustation is formed only when there is a drouth; it is a gradual process. In countries where a whole season is dry, the soil becomes whitened with salts. Rains dissolve them and they sink again into the soil, though a portion will be carried away by water. An effect of a drouth upon a clay soil is to cause a shrinkage of the mass. It will then become still more difficult for roots to penetrate it, and hence, when drouth occurs early in the season, the crop is starved for want of nutriment, the roots cannot spread through an impervious mass. But sand simply dries without diminishing its bulk, but this process takes place with greater rapidity than upon clay soils, the latter being close and more retentive of moisture than the former.

§ 32. The rise of water to the surface from beneath, is familiarly illustrated by the putting of water into the saucer of a flower pot; its rise to the surface is well known. Flower pots are watered with

common rain water or charged with fertilizing matter which is conveyed to the roots. In long continued drouths when the water rises from a depth of 4 or 5 feet, instead of carrying up matter compatible with the nature of the plant, the astringent salts take their place, injurious effects to vegetation take place in addition to those which arise directly from the want of rain. These injurious salts are easily corrected by the use of lime or marl. When they reach the neighborhood of the roots if lime is present, it will decompose the salts and form gypsum. Fruit trees which send their roots deeply into the soil are often injured by the presence of these salts. From the foregoing facts it is evident that the subsoil should be examined for poisonous salts, and when the ditches or deep layers are exposed in cuttings for roads, and should become partially incrustated with astringent salts, it will be important to institute means for correcting this condition of the deep subsoil.

§ 33. The foregoing remarks apply to those varieties which are purely *clay* or sand. Composition may modify results materially; if for example a soil whose composition retains a preponderance of clay and yet has a due admixture of organic matter and lime, its ability to stand a drouth is greatly increased—for organic matter and lime not only retain moisture strongly, but they affect the texture favorably, and counteract the tendency to excess in shrinkage.

§ 34. As drouths in North-Carolina are much more injurious than excess of rain, it becomes a question of importance to know how to guard against their effects. The first point to be attended to, is to drain deeply. This will affect gradually the texture of the clay; it will become more porous, while its natural affinity for water will not be diminished; that is, it will be sufficiently retentive while the excess of water will be drained off. Clay may be regarded as requiring a specific amount of water; but at the same time its capacity for receiving and holding a greater quantity than this, is proved by experience. Another change may be affected by the free use of organic matter, which, when mixed with the soil, makes it porous. In the cultivation of not only clay soils, but sandy ones, crops should be planted as early as possible, that the surface may be protected by the shade of the growing crop. To be able to plant early, in clay soils especially, the water must be disposed of by drainage. Two weeks may be saved in many cases by drainage; that is, the land will admit of the plough two weeks earlier

in drained, than in undrained lands. Give a crop of corn two weeks more of growth than another piece equally well prepared, and the former will live through an ordinary drouth without injury, while the latter will not become half a crop.

§ 35. Absorption of moisture from the air takes place principally during the night, and unabsorbative power is less in sandy than clayey soils. This respite from heat, which causes so much evaporation during the day is of the highest importance. Even when dew does not fall, soils take a small quantity of water from the atmosphere. A stiff clay, it is said, sometimes absorbs one-thirtieth part of its own weight. Dry peat will also absorb nearly as much, but its power depends upon its condition; if very fine it absorbs more than clay; if coarse, less. The best condition of a soil is without doubt a mixture of clay and organic matter, where it is necessary to guard against droughts.

§ 36. The surface temperature of soils differ according to their composition. Water in all soils favors a low temperature because the evaporation carries off heat in the invisible vapor which rises from the surface. So long as an active evaporation goes on the surface continues cold, hence in swamps and bogs where the supply is inexhaustible, very slight changes only occur during the summer. When the surface becomes dry it begins to rise, and if the air is only 60° or 70° in the shade, the soil will absorb and accumulate heat and may rise to 90° or 100° .

Color has much effect upon temperature. The darker the color, all things being equal, the greater is the absorbative power. The correctness of the common opinion with respect to the natural coldness of light colored clay soils is correct.

§ 37. It is stated by good authority that the amount of evaporation from an acre of fresh ploughed land is equal to nine hundred and fifty pounds per hour for the first and second days after plowing. The rapid evaporation diminishes every day. Evaporation begins again by hoeing, but the moist surface thus exposed has other functions besides the evaporative one. Moist surfaces are much better absorbents of ammonia from the atmosphere than dry ones, and one of the most important effects of stirring the soil often, arises from its increase in absorbative power. Water in the soil is disposed of by forest leaves or by the vegetable kingdom. A single tree $8\frac{1}{2}$ inches in

diameter and 30 feet high expired from leaves in 12 hours 333,072 grains of water.

§ 38. An acre of woodland evaporates 31,000 pounds in 12 hours. During the summer, embracing 92 days, the whole amount of evaporation will amount to 2,852,000 pounds. Forests and vegetation generally largely aid the disposal of excessive water in the spring. Water of course accumulates in the soil during winter. Our wells receive their supply and springs have their sources of water replenished.

It is true, however, that the removal of forests presents a seeming anomaly, for where large tracts of country are shorn of their trees and forests, there the head-waters of our rivers fail or diminish. Evaporation is greatest from a shorn surface, and a country is on the road to ruin when its woodlands are mostly destroyed or consigned to the axe.

But woodlands require a change. Rotation is as necessary to the forest as to the successive crops of the farmer. We see this in the death of pines over large areas of this State. The idea that death was caused wholly by insects is fallacious. In it we see, in part at least, a natural effort to change the kind of vegetation. Oaks and hickory replace the pines. For hundreds of years pines had been the staple products of large tracts in this State. Is it therefore remarkable that a light soil containing the true pabulum of life for the pine, should have been nearly exhausted and the pine should have thereby become weakened and more liable to disease than formerly?

§ 39. The absolute weight of different soils is also variable. A cubic foot of clay, with its moisture, weighs about 115 pounds. The same quantity of damp sand 141; while peat, with its water, weighs only about 81 pounds. The weight of soils affects the labor of tillage. More force is required to lift a sandy soil than a clay. But the texture or compactness of an undrained clay soil more than makes up for its less weight.

In every point of view the farmer is encouraged to ameliorate the mechanical condition of his plantation. The first point requiring attention is its water or drainage, for when a soil is water soaked, good crops are only to be made in the most favorable season.

A subsoil of clay beneath sand is ameliorated by draining, though the top may appear to be sufficiently dry; for the clay may be

regarded as a reservoir of water, just as the filled saucer beneath the flower pot.

§ 40. We may recognise in all these facts two currents which may be found in soils; a downward current, which disposes of surface water, and an upward current, when the surface water has become exhausted. This arrangement is a wise one, for if there were no upward currents plants would perish, both for want of nutriment and water during drouths. This result would be far more likely to happen in the case of the cereals and cultivated crops, than in the plants which grow naturally in the soil.

CHAPTER V.

Mechanical treatment of soils. Deep plowing. Advantages of draining. Open drains. Plowing. Objects attained by plowing. Harrowing. Roller. Improvement of soils by mixture. Hoeing. Effects of hoeing.

§ 41. No doubt the proper mechanical treatment of soils is the most important part of husbandry and farming. By mechanical treatment we mean plowing, hoeing, harrowing, etc. If contrasted with the chemical treatment or with the use of manures, it will be evident that unless the mechanical treatment is right, much of the labor and expense of manuring will be lost. Probably there is no part of farming which is executed so poorly in North-Carolina as the mechanical treatment of soils. It fails to be effective for want of depth. It is true, we believe, that climate should be considered when the question of deep plowing is to be answered. That regard should be had to climate will appear from what has been said in the foregoing chapter with respect to the evaporation from freshly plowed surfaces. Under the more powerful influence of the sun's rays in the Southern States, the question may be raised whether the plowing which in New-York is called *deep plowing*, from 12 to 14 inches deep, might not result in two great a loss of water. But whether this question is answered in the affirmative or not, it will

be found true that deeper plowing than is usually practiced will be attended with greater success.

Preparatory to plowing stands *draining*; not always, but frequently. An important question to be answered is whether any given tract requires this preliminary treatment. Observation may readily return the reply. If water stands upon the surface only a few hours after a rain, it is probable draining will benefit the tract where it stands. If a bed of clay lies near the surface it is called for even if the top is sand. All swamps and bogs of course require it. In all the eastern counties there is a continuous bed of impervious brick clay, which often is not less than one foot from the surface, and its materials are often blended with the sand where it lies deeper. This yellowish white clay will frequently be found cropping out in ravines where its position may be determined, and having determined its position, it will aid in solving the question of drainage. This bed of clay varies from four to seven feet thick, and is overlaid, and also underlaid with sand. These sand beds vary in thickness, and are always above the marls, unless we reckon among marls the recent shell bed of the coast. In drainage it is unnecessary to cut through the brick clay; it is sufficient to cut deeply into it, though the drainage will be more perfect if it is cut through. Another indication of the necessity of special drainage is furnished where springs issue near the surface. These are always thrown out by an impervious stratum. This impervious stratum may be sought for in ravines, or by boring with an auger of a suitable length; its depth beneath the surface may thereby be determined.

§ 42. Sandy clays which are sufficiently cohesive to be formed into balls by the hand when moistened, will require drainage. In drainage we not only have regard to surface water, to draw that off, but we must cut into the impervious stratum sufficiently deep to take out the water confined in its upper layers or beds. Otherwise the soil will rest on a bed always saturated with water, and always giving it off from the surface in vapor, and hence, will maintain a surface too cool for the growth of cotton or corn.

Another fact should be thought of and considered. Old soils become more compact and clayey by cultivation; and though in its new state crops were sure and certain, yet, in process of time, a change takes place. The greatest change is in the subsoil, which

becomes partially consolidated by the infiltration of the oxide of iron and carbonate of lime. Free percolation is stopped, and this partially indurated stratum should be cut through to restore a free passage of water. Breaking it up with a subsoil plow is not sufficient with many persons; this pan, as it is called, must not be cut. Experience, however, justifies it, and no harm ever follows from the practice.

§ 43. Drainage has been spoken of and recommended in the preceding chapter, but one or two advantages should be more distinctly stated. It is the openness which follows, and by which air penetrates freely the strata. The advantages, or it should be said the necessity for oxygen in the soil, is *absolute*, especially where organic matter exists, for we have shown that oxygen must change the vegetable fibre into *humates*, *geates*, and *crenic* and *apocrenic acids*, etc. All these changes are accompanied with the disengagement too of carbonic acid. If the vegetable fibre is confined in wet soils, it is converted into a peat only, in which state it is not fitted for vegetable assimilation. But in soils *air* must circulate; and when it is too close and compact, circulation can be effected only by drainage.

From the foregoing, it is plain drainage effects two objects:

§ 44. 1. It raises the temperature of the soil by sending the water in subterranean channels to distant parts. 2. It opens the texture of soil and permits the free passage of atmospheric air. Both the mechanical and chemical wants of vegetation are provided for by drainage. Among the advantages of draining one has already been fully stated; but still, let it not be forgotten that by it *seed time comes earlier*, where soil is drained, and it may and will happen that to an earlier planting a good crop is mainly due. A result of this kind, together with a larger crop for one or two seasons, will more than pay the expenditure incurred in the operation.

But when a general system of drainage for the country has been carried out, the general health of all its citizens will be secured. Stagnant pools will not exist; the water of wells will be improved and the climate will be measurably changed. Nothing can be more important than the sanitary effects of good drainage. The great source of intermittent fever is in stagnant waters. It is true we cannot prevent the freshets which give origin to miasmata, but

even here, drainage will have a salutary influence by carrying off at an earlier day the surplus waters.

The volume of this water is replaced by air. Hence it is plain that a very important change must necessarily take place. While soaked with water, which contains but little air, no chemical changes take place which produce fertilizing matter. The changes are preparatory only, but the peaty matter or peat itself, will remain peat, or become real coal forever. But draw off the water and replace it by atmospheric air with its active principle, *oxygen*, and a new order of things begins.

§ 45. Drainage is not neglected in North-Carolina, but its system is defective. Open drains are usually made; they effect the object less perfectly than *tile draining* when properly laid down. The former are obstructed by the growth of weeds, and the banks are in part closed to the free exit of water. They are also inconvenient, and hence, it is to be hoped, the time is not far distant when *tile* will be used. These remarks, however, are applicable to the uplands, the swamps must be drained by open ditches and canals.

§ 46. The operation next in importance to drainage is *plowing*. By the plow the surface is designed to be pulverized, should be pulverized, or else the operation is badly performed. The condition of the surface must be right, or else it will be imperfect, however skilful the holder of the plow may be. If wet, it should not be undertaken. This is a settled and well known point, but it is not always observed, for a large amount of pressing work in the spring may in one sense compel a farmer to plow before the soil is dried. Plowing is an old custom, and the experience of the world says that nations have prospered and communities prospered in the direct ratio that this operation approaches perfection. We throw out of mind all that is done in a new soil full of roots and stumps. Great crops of corn have been raised where the plow could not run. But every old country where roots, stumps and briars have been disposed of and the soil has found its level, there the plow must run. The importance of plowing is felt everywhere, is shown by the inventions of mechanics and farmers to perfect the machine and make an instrument which is adapted to all surfaces and depths to which the machine may be driven by cattle and the hand of man. The evil arising from plowing wet land is the lumpy condi-

tion of the furrow mass, and as these dry they become really indurated in the sun, and the consequence frequently is, that such a condition of the soil remains for one or two years.

Another important principle differing in kind from the foregoing is, that furrows should not run down hill; they should encircle the knoll or hill-side in order to divert streams from a direct descent, and thereby cut a side-hill ditch and finally lead to the formation of unseemly gullies. These, however, are not only unseemly, but monstrous evils, and especial care needs be taken in working the soils overlying the free-stones of this State. The first thing to be effected in plowing is good pulverization, the next is to open the soil to a sufficient depth for the roots to spread themselves, and an indirect benefit is secured when these two ends are accomplished, that of helping a crop through a drought without injury. The reader will understand the mode in which this comes to pass by applying the principles already stated.

Washing and the formation of gullies is also prevented in part by deep plowing. The subsoil plow is called into requisition to deepen furrows, but not to bring the broken substance to the surface. By deep plowing, especially if aided by the subsoil plow, the soil will absorb double the quantity of rain, and hence, diminish the amount which would otherwise escape in streams over the surface, and thereby carry off good soil, and tend to the formation of gullies.

Pulverization, an open, porous condition for roots to penetrate, depth for absorption of rain, together with a perfect mixture of the matters of the soil and fertilizers, are objects to be attained by plowing. These are all to be kept in view.

§ 47. The harrow and bush become necessary to break the lumps and form an even surface for the reception of seed.

The whole operation of seeding and providing for the germination of seed is completed by a heavy roller. This acts superficially, but fewer seed are lost by its employment, especially small seeds. Let a person step upon a celery bed and he will find that double the number of plants come up where the soil is pressed, than where its surface remains loose. It is to be regretted that the roller is not more frequently employed. It crushes clods which have escaped the harrow, and makes withal an even surface.

§ 48. The mechanical condition of a soil can rarely be ameliorated by mixture. Those which really require mixture are stiff clays and loose sands. If a mixture can be effected by the plow, it will no doubt pay. But it becomes quite questionable, whether a farmer can haul sand to mix with the clay, or clay to mix with the sand. The cost of hauling is too great. A gardner may make the necessary mixture. At any rate, before a farmer attempts to change a field of ten acres by mixing clay with sand, or the reverse, he had better count the cost beforehand. Now although a barren sand will not probably be benefitted by draining, yet the texture of the stiffest clays will be; and as clays are mixtures of silex and alumine, and as they are often, if not generally supplied with the alkalies and alkaline earths, the most direct as well as the cheapest mode to cure a clay of its stiffness, will be to remove the water by under drainage.

As it regards sand, it will be cheaper to employ calcareous fertilizers with forms of muck than to mix with it clay.

The theory of amendment by mixture is perfectly satisfactory; but in practice, it will be found a losing business, where either material has to be carted many rods.

§ 49. To recur once more to the subsoil plow in connexion with the clays too stiff to cultivate; it has been stated, that the subsoil plow should not be used until the land has been well drained. When considerable moisture exists in the clay, it unites and becomes solid and impervious, so that little benefit has been experienced in certain cases from subsoiling; but when the water has been drained off and the clays have become loose and porous, the masses raised by the plow still remain in this condition, or become still more porous, so that the beneficial effects of subsoiling a stiff under clay will not be secured till after the land has been well drained.

§ 50. It is scarcely necessary to speak of hoeing or the use of the cultivator. They are needful operations and no one omits them; but why hoe? is it simply to kill weeds? Hoeing kills weeds and pulverizes the soil, but it has an effect which is unseen except from its effects which are liable to be misinterpreted. The good effects of hoeing arise from the moist surface created, and which absorbs ammonia. That the beneficial effects do not all arise from the destruction of weeds and pulverization is evident from the fact that

the more frequently the surface is stirred and a moist surface exposed, the more vigorous the growth of the crop. The properties of ammonia remove all doubts respecting the effects of hoeing. Let the vapor of hartshorn in a receiver or tumbler be placed over a vessel of quicksilver, and then introduce a mass of moist soil, and see with how much rapidity the whole of the ammonia will be absorbed by the moist soil. Ammonia always exists in the atmosphere, and it is obtained in dry weather by exposing a fresh surface of soil to the atmosphere. Hoeing is a cheaper way of obtaining ammonia than buying it in guano; we get it in dry weather, and it is agreeable to the experience of all good observers, that hoeing in dry weather is followed with greater benefits than if the weather is wet. Gardens are hoed more frequently than field crops, though it may be supposed that the vigorous growth in the former is due to a rich soil. Still, the good effects of hoeing are too demonstrable to the eye to admit of doubt. Hoeing, however, is laborious, and too much time is consumed to admit of its repetition in field crops. To supply the place of the hoe the cultivator comes in, and no doubt its more frequent employment in dry weather, not simply to kill weeds and break sods, but to create a moist surface which will absorb ammonia, and which is now known to be so needful to all crops. Dry surface has little or no absorptive power as may be shown by introducing a ball of dry earth into a tumbler, or receiver of hartshorn in vapor.

CHAPTER VI.

Soil elements preserve the proportions very nearly as they exist in the parent rock. Weight of different kinds of soils. Most important elements of soil represented by fractions. Effects of small doses of fertilizer explained. Nature deals out her nutriment in atom doses, and so does the successful florist.

§ 51. It is well established by experiment and observation, that the soil contains, in its ordinary state, all the elements the vegeta-

ble kingdom needs. It is also known that all may be, and are probably derived from the solid rocks of the globe; and hence it will follow that the composition of the soil will not differ materially from the parent rock from which it is derived; and what is particularly worthy of note is, that the proportions of the elements will be found in the soil as they exist in the rock; and that where an element or compound is in excess in the rock, so it will be found in the soil, and where the proportion is small in the rock so it will necessarily be small in the soil. We propose in this chapter to state the quantities of elements in soils, and it will appear that though many important substances are extremely minute when put in a table of the common form used in chemical analysis; yet, if calculated therefrom in absolute quantities per acre, they are very large.

We have given the weight of cubic feet of sandy, clayey and peaty soils; these data will give the weight of a layer of soil of the area of an acre and one foot deep. A granite soil with its usual state of moisture weighs about 90 lbs to the square foot, and the superficial square feet of an acre weighs 3,920,000 pounds. If granite is composed of two-fifths quartz, two-fifths felspar and one-fifth mica, its composition will be represented by the following:

Silex,	74.84
Alumina,	12.80
Potash,	7.48
Magnesia, .....	.99
Lime, .....	.37
Oxide of iron,	1.96
Oxide of manganese, .....	.12

It will be seen that in this and all other analyses of rocks and soils, that silex and alumina constitute by far the largest parts, while those elements which seem the most important to the vegetable occur, or are represented by fractions, and generally the fractions are much less than in the case selected. The potash given is the potash of the rock, and thus never occurs in the soil, and the fraction which should represent the potash of a granite soil will not exceed one-half of one per cent. in consequence of its solubility. But if it equals the lime, .37, the amount of potash in one hundred pounds of soil will be three-eighths of a pound. If the per centage

amounts to one-half of one per cent., there will be over twenty tons of the substance in the mass of soil, one foot thick and within the area of an acre. The small per centages, therefore, in an analysis, when calculated for a field, become large and important figures; and even where the Chemist makes his note as a trace, and which indicates its presence, without being able to weigh the element, it is still sufficient to meet the wants of vegetation. It is still greater than the farmer employs even when he uses gypsum, and much greater than when guano is employed. The interesting question then comes up, how can the great effects of guano be reconciled with the small quantity used? Two hundred pounds of guano to an acre, sown broadcast upon a wheat field, produces visible effects as far as the field can be seen when growing, and is known to double the crop. How can the great effects, then, be accounted for when the quantity is so small that it would be difficult to detect it in a pound of soil?

We may conceive it to be explained in this way: It is all dissolved and evenly distributed in the mass of soil, and is brought directly to the roots of the growing plant in the right condition to be taken up. It is not the absolute quantity called for by the crop, it is the state or condition of solution. Supposing four times as much used, and hence the solution would be four times as strong, would it produce quadruple effects? certainly not. Experience does not sanction the doctrine; instead of good effects, the crop would be hurt, or if taken up by the rootlets at all, it is too strong, and the probability is that much would not be taken up, as the strength or suspended particles of nutriment could not be received into the vegetable tissues at all.

We account then for the striking efforts of apparently homeopathic doses of fertilizers, on the ground of their solutions being adapted to the mouths of the spongioles through which the nutriment must enter the vegetable organism, and the adaptation in this state to the constitution of vegetables. All concentrated doses are rejected. All floriculturalists who produce beautiful flowers, employ agents extremely diluted. Others, who do not understand the business of feeding beautiful plants, attempt to cram them with too much and too rich solutions; the consequence is, the plants are killed outright, or else become yellow, their leaves drop, the whole plant indicates suffering.

It is highly probable too, that a farmer might produce results as beautiful as the florist, by pursuing like means; applying his fertilizers in a state of extreme dilution, in which case it is evenly distributed to roots and in a state in which it can be taken up. Facts constantly occurring in the analysis of soils, favor, and even sustain the doctrine. For how much soluble matter is there in one thousand grains of soil? It is possible to obtain one and one and a half per cent, consisting of 12 to 14 substances. Nature seems to dole out her treasures; instead of dealing liberally as befitting her, she gives atoms. There are practical principles in the facts developed. If soluble substances are employed, they too must be dealt out in atoms only. A few atoms at a time only are found in solution in the soil. The vegetable organism is only fitted to receive atoms; and in this we see adaptations which must be repeated. It is true, turkeys, swine and men may be crammed and fattened; but this system will not succeed in raising wheat, cotton or corn.

CHAPTER VII.

Fertilizers defined. Their necessity. Mechanical means of improvements of soil. Effects of lime. Growth is the result of change in the constitution of the fertilizers employed. Organs have each their own special influence upon the fertilizing matter they receive. Provisions for sustaining vegetable life. A system of adaptive husbandry. Instances cited. Adaptation of a crop to the soil. What fertilizers will ripen a crop at the right time. The source of fertilizers. Green crops. Peat. Advantages of a green crop. Marine plants. Straw. Losses of farm yard manure. Peat, how prepared for use. Composts. Fertilizers of animal origin. Solids and fluids.

§ 52. A FERTILIZER is a substance which promotes the growth of vegetables. In this definition is included water, and a great variety of bodies which would scarcely be ranked under the name of manures. The latter term is generally applied to the excrements of animals, and yet, it has a wide signification, so that when we

have really determined the number of bodies which may be classified under it, we find that its meaning is as extensive as that of fertilizer.

§ 53. The necessity which has given rise to the use of this class of bodies, is the excessive taxation of the natural resources of soil for the support of much greater crops than the soil would spontaneously produce, and this taxation being prolonged century in, and century out, the necessity now for resorting to their use and hereafter, has become a fixed institution, established in absolute dominion upon the money and labor of all who have anything to do in agriculture in earnest. The improvement of the soil by mechanical means extends farther than the simple movement of it in a certain way, turning it over with the plow, breaking up the compact matter at the bottom of a furrow, exposing fresh surfaces with the hoe or cultivator; for in all these there are excited chemical actions, whereby combinations promoting growth take place. So also the employment of chemical bodies do not end strictly in chemical changes; mechanical ones result from chemical actions. Witness the effect of quick lime upon a clay soil; it becomes porous and light, even more so than by the use of the plow and hoe; besides, it is a *permanent* change in texture as well as composition. From the foregoing facts, it will be seen how one system of improvement connects itself with another, and that the institution of one system of means sets in motion those which seemingly belong to an opposite kind. We repeat that mechanical agencies result in chemical, and chemical ones result also in mechanical. All means, therefore, for improving the soil belong to double systems, excepting those instances where a fertilizer is selected with reference to a single result, as is often the case in most of the soils; as in sulphate of ammonia, nitrate of potash, or phosphate of lime.

But still, fertilizers improve soils by chemical agencies, and we shall now consider them in this range of their functions, leaving out of view any mechanical results they may produce.

§ 54. All applications of substances designed to promote growth do not always act by the results of change in themselves, nor by inducing chemical changes in others prior to their introduction into the organism of the plant. But by far the greater number of fertilizers undergo a change somewhere before they are assimilated,

or become incorporated into the vegetable body. We cannot think of any thing, how much alike it seems to the constitution of organized matter, which must not be changed in its chemical constitution before it finds its destined position in the vegetable structure. Water, it is true, acting as the vehicle by which food is conveyed inward, passes through and out again by respiratory pores and undergoes no change; but, what it transmits, must be changed. The actions of organs have much that is special; each organ its own wants, and its own apparatus to supply them. The husk of a kernel of grain demands its supply, and though it gets a supply from the common circulating store, yet its organization elaborates from that supply, something quite different from that of the kernel, leaf or stalk. The changes indicated are regarded as chemical, with what, and how much right, we cannot decide. There is a vitality in each and every part and organ; how much is to be attributed to this principle has never been agreed upon; but it is supposed by some that this principle is a force or power controlling the movements in question; yet, the changes in the substance are like unto chemical products taking place independently of this subtle force called *vital*. But the foregoing is a departure from the track or line in which we designed to move.

§ 55. But before we speak of the fertilizers we may profitably look at or consider the natural provisions for sustaining vegetable life when left to the workings of its own unaided machinery. The machinery consists of organs for support and reception, discharge and growth. The first are the roots, which consist of a tapering stem which sends off threads terminating in a congeries of exceedingly minute orifices, which are called *spongioles*, whose office is to obtain, and we might perhaps say, *select* nutriment. The second class of organs are the leaves. They exhale water, in vapor of course, from pores which are mainly located upon the under side. The water is pure, though it has been the carrier of food, as it is called, from which has been manufactured salts, sugar, starch, extract, gum, woody fibre, etc. The superfluous water escapes from the surface of leaves. But leaves, besides performing the office of exhalation, perform that of reception, or of absorption. This office, however, appears to be an important one in the clover and allied plants; while in the cereals, it is much less so. The movement of water (and when impregnated with foreign matter, is

called sap,) is upward and outward, so as to distribute it to the new growing organs. It passes into cells in its upward progress, where it is changed or assimilated, and becomes by its passage through them, perhaps by the action of its walls, *vegetalised*, if we may coin a word answering to *animalised*. There is motion in all directions, but the currents tend upward and outward, so as to reach the extreme bud and leaf. This is a necessary result, because the bud, leaf, and extreme of the branches seem to be the source of the force by which circulation is carried on. In the workings of this imperfectly described machinery, which may be regarded as belonging to a tree, we find organs which are but temporary in their office, and which therefore require periodical renewals. These are the leaves, fruit and bark. The permanent organs are the trunk with its limbs, and the roots. The growth is both aerial and sub-terrestrial. The latter keeps pace with the former; the roots spread equally with the branches, and that the roots may be fed they penetrate outwardly into new feeding grounds, which like the leaves, bark and fruit in falling after decay, help supply the necessary nutriment. They re-supply in part, and once again traverse the organism.

§ 56. Time, also, is not to be lost sight of in the range of enquiries relative to fertilizers. It may be, and is, of great importance to get an early and good stand; the result of the crop may turn upon this one point. Hence, what treatment, what fertilizer will best fulfil the end sought; for instance, in a crop of tobacco or cotton? What is wanted is an early, or indeed an immediate effect; one which will not retard the germination of the seed, but which will act *gently* upon the infant plant. The dose, too, is an important consideration; a tea-spoonful of broth is not too much for the infant, while a table-spoonful, which an adult stomach would manage, would be too much for the former.

There is another enquiry in range of the specialities we are considering. What fertilizer will ripen a crop at the best time and manner? This may not have been thought of so frequently as some other questions; but the tobacco grower's attention has been turned to it. This crop must ripen evenly before frost; and as it is a *leaf ripening*, not a seed, an organ which has no connexion with the organs by which the plant is propagated, but is supplied with cellular tissue, which may grow and develop itself indefinitely,

and which, under the influence of abundance of nutriment, will keep green ; this organ, the leaf, may not ripen at the right time, and may ripen quite irregularly and the crop be half spoiled. The problem, then, for the tobacco grower to solve, is, what fertilizer will spend its powers and exert its properties to the best advantage in order that the leaf shall not grow too large, but expend or exhaust its power before frost, and thereby promote its ripening at the right time ; for, as long as the leaf is encouraged to grow by the fertilizer employed, it will not stop to ripen. The leaf is under a different law from the organs which propagate the species, though even these may not put forth their powers when the woody system is over stimulated with nutriment.

A system of husbandry which is now called for is *adaptive*, or to use another term of like import, should be as far as possible *special*; by which we mean, the use of those means of improvement which are adapted to the *soil crop*. It is now proved by experiment, that phosphatic fertilizers are better adapted to the growth of turnips than ammoniacal ones, and that a combination of ammoniacal and phosphatic are best suited to wheat. These are instances of adaptive husbandry. How many such instances will be established by experiment and observation we cannot tell. But their discovery is in the right direction ; it is a progression towards perfection. So also as to the mode of application ; abundant experience and observation point to the fact, that surface application is the true mode for grass lands. But it may not be the best for corn lands ; it may not supersede a more immediate application of certain fertilizers to the hill of corn.

So again, the adaptation of a crop to the soil and to the condition of any particular kind, is an established principle. Clayey lands are better for wheat than sandy, and sandy soils grow rye better than they do wheat. But observations in this direction are older than those which are established relative to the special use of fertilizers. The enquiry is and has been in the mind of every farmer, what is this piece of land adapted to ? What kind of crop will be the most profitable ? and the consequence of this kind of enquiry has been to establish many important practical results which are now acted upon every day by our best farmers. This field of improvement comes first in the order of time ; and from the nature

of things, has made greater progress than that which comes from the special use and adaptations of fertilizers.

§ 57. Fertilizers belong to the three kingdoms, and it will promote a systematic view of them by adopting a classification corresponding to their origin or source.

The most striking difference in these classes is their bulk and the quantity which is to be applied. Those fertilizers which are derived from the vegetable kingdom are bulky; and hence, one important result is secured, which cannot be obtained from the others, especially the mineral kingdom; they lighten the soil and make it more open than the other two; a result which is due from bulk alone, while, if porosity results from mineral fertilizers, it is in consequence of chemical changes in the soil. Mineral manures are more special than vegetable or animal; which arises from the fact that they are less complex in their composition, or consist of two or three elements only. We might have made another class, inasmuch as some of the most favorite compounds are composed of substances derived from the three kingdoms. These are composts, and it might at first sight be inferred that *guano* ought to be classified in both the mineral and animal kingdoms; but it is plain that what is strictly mineral in it is secondarily derived from the animal kingdom only; as it consists of the excrements of birds, who have subsisted mainly upon fish or other animal bodies.

§ 58. Vegetable fertilizers do not furnish exclusively vegetable matter, they also yield up mineral matter, which has already been mentioned under the name *inorganic*. It is that which has been taken up and fulfilled its functions in the vegetable organism, and now, after its death, it is again separated by a series of chemical actions, and restored again to the soil. It is probably the best part of it, and sooner or more easily soluble, or more quickly prepared for its reception into the vegetable organism than the unchanged elements of soil.

§ 59. Vegetable fertilizers are matters which have decomposed; their particles separated as well mechanically as chemically; in fine, which have passed through a series of changes which have resulted in the formation of a class of new bodies. The vegetable loses its green, and is blackened, as if charred, but at the same time is softened and becomes pulpy; the fibrous structure disappears and the organization is broken up. It has become subject to

chemical laws. The common term is *rotten* or *rotted*. All vegetable matters pass through the same changes, whether matured wood, twigs or leaves. Matured wood requires more time, but ultimately it will become a mixed fertilizer, and have a value proportioned to the kind of inorganic matter combined with its quantity; for observation and experiment proves that the pines, poplars and willows have less mineral matters than oak, hickory or birch; and certain parts have more than others. The bark of the oak is richer in lime than the wood; the twigs and leaves are richer in phosphates than the wood, and the fruits are worth more for fertilizers than other parts, because they contain more potash and phosphates combined. One thousand pounds of the willow wood will enrich the soil four and a half per cent., while one thousand pounds of dry leaves will enrich it at the rate of eighty-two per cent. Leaves then would bear hauling much farther than the saw dust of willows or pines; hence, it will be perceived that leaves must produce a much greater effect; they are richer in the money elements.

Fertilizers belonging to the vegetable kingdom are used in a green or in a decomposing state, as in green crops, plowed under and in the condition of peat, or peaty matter formed in bogs, and in a state of partial decay.

Green crops are fertilizers of the first order, being decomposable speedily in consequence of the full charge of sap which they contain when plowed under the sod. They change into a light black mould and assume the condition of a compost heap. A crop is selected for this purpose which grows rapidly, has extensive roots, and is supposed to obtain its stock of materials in part from the atmosphere. This last is considered a clear gain. The extended roots concentrate the mineral matter in the plant, and if its roots run deep, bring up fertilizers beyond the reach of the wheat plant. At any rate, whatever the green crop contains is laid down in a layer some four or five inches beneath the surface, and is really a magazine of food.

The red clover and buckwheat are employed most frequently in the northern and middle States, while the pea is best adapted to the latitude and climate of North and South-Carolina. But all that part of North-Carolina which lies north of the Central Railroad, may sow clover instead of the pea. But the pea is a richer plant,

especially if the plant is mature, and its pods filled with fruit. The pea has long roots; we have found them twelve feet long. Green manuring is not confined to the plants named; all the clover class, as lupin, lucern, etc., borage, turnips, and wild mustard are sown in Europe for the same purpose.

§ 60. The advantages accruing from green crops are numerous, but they are both mechanical and chemical; the *development* of ammonia, nitric and carbonic acid within the soil and which therefore are in the best condition to be absorbed by it, belong to the latter.

It is maintained that a green crop plowed in enriches the soil as much as the droppings of cattle from three times the quantity of green food consigned to the soil by the plow. Another advantage claimed is, that about three-fourths of the whole organic matter is derived from the atmosphere. This is the most likely to be true in the clover and bean family.

Those who reside near the sea may obtain sea-weed, and plow it in, in the same condition that it is cast upon the shore. Sea-weeds decompose readily; they yield both organic and saline matter, and are nearly equal, for potatoes, to barnyard manure. Sea-weeds are a specific fertilizer for asparagus, a sea-shore plant. The coast of North-Carolina, however, does not abound so much in this class of fertilizers, as the northern rocky shores of the Atlantic. The foregoing fertilizers are employed in their wet state. The following are spread upon the ground dry.

§ 61. Straw of all kinds are used as fertilizers. In the condition of straw or hay, which is a plant dried in the sun, the decomposition is comparatively slow, even if buried in the soil. Mixed with animal matter in heaps, its change is rapid; fermentation is induced which soon reduces the mass to a bulky consistence, or the fibre of the straw is separated or broken, and admits, thereby, of a ready incorporation with the soil.

Fertilizers undergoing a series of changes in the yards where they are formed are subject to a considerable loss of weight. The figures given by Johnson are the following. A recent mixture weighs, for example, from

	46 to 50 cwt.
After 6 weeks, weighs	40 to 44 "
After 8 weeks, weighs	38 to 40 "
After when half rotten, weighs	30 to 35 "
And when fully rotten, weighs	20 to 25 "

A loss of more than one-half of its weight during the time required to make what is called *short manure*. But it is not a loss of one-half its value. It may be inferred that the principal loss in weight is water, though ammonia and carbonic acid also escape. But an informed farmer would stop the loss of valuable parts by the use of absorbents, as plaster, weak solution of sulphate of iron, sprinkled over the heap or mass, while fermenting. By these means, if the loss in weight was not entirely prevented, it would greatly diminish that which is regarded as valuable and be confined to the watery parts.

Covering the dry manure in the soil answers the same purpose. Among the dry materials generally discarded by our farmers is *saw dust*. It lies in great heaps around the sites of old saw mills, and has never, in this State, been employed as a manure. It is true that it generally consists of pine, still, on sandy lands, applied in small and repeated doses, it will supply organic matter and prepare the way for a satisfactory use of marl. One hundred loads to the acre is a suitable quantity. This should be spread and ploughed in.

§ 62. The seeds of all plants are richer fertilizers than the stems or leaves. Cotton seed is in great repute, indeed all that furnish oils seem to be well adapted to promote vegetation.

Rape seed (*Brassica napus*) is equal to cotton seed, but is too valuable for its oil to be employed before expression. The cake which remains is still valuable.

§ 63. Peat is one of the most common materials which has been employed as a fertilizer, and has received the same sanction of those who have used it, and as it is widely distributed it is necessary to notice it in this connexion. It may be regarded as the basis of all composts. It may be employed by itself, provided it is brought by sufficient exposure to the air and moisture to pass into a pulverulent state when mixed with the soil. If lumps of peat, which have dried in the air, are buried in the soil, they continue in the condition of lumps as a nuisance for two or three years, but if kept moist in a heap, and a species of fermentation is excited, it then pulverises and mixes readily with the soil.

Peat is best prepared for crops by composting it with other substances. Johnson gives the following formula as the best, all

things considered, especially with reference to the cost of materials, and the effects which are produced :

Saw dust or earthy peat, (muck,)	40 bushels.
Coal tar,	20 gallons.
Bone dust,	7 bushels.
Sulphate of soda, (glaubers salts,)	1 cwt.
Sulphate of magnesia, (ep. salts,)	1½ cwt.
Common salt,	1½ cwt.
Quick lime,	20 bushels.

“ These materials are mixed and put into a heap and allowed to ferment three weeks ; then turned and allowed again to ferment, when the compost is ready for use.

“ This compound is compared with guano, both as a fertilizer for hay and turnips.

“ On hay, per imperial acre :

	PRODUCE.	COST.
Nothing,	416 stones.	
Guano, 3 cwt.,	752 “	\$7 50
Compost, 40 bushels,	761 “	5 00

“ On turnips :

	PRODUCE.	COST.
Farm yard manure, 28 yards,	26 tons.	
Guano, 5 cwt.,	18 “	\$12 50
Compost, 64 bushels,	29 “	7 75

According to the foregoing experiments the compost seems to be better than guano.”

But Johnson remarks that the experiments need repeating, and yet from the nature of the compost there is nothing improbable in the results. It will be observed that the compost contains coal tar, a substance which, *a priori*, we should be very likely to place any where else than in a list with fertilizers, yet experience proves its value.

A combination of one hundred parts of plaster, and from one to three parts of coal tar, well mixed in a mortar, is valuable in agriculture. For certain purposes olive oil is added, as when the mixture is designed for application to putrid sores, etc. This is principally used, but without the olive oil, in place of chloride of

lime to disinfect sinks, privies, etc. It purifies water in a short time.

But it is also valuable in agriculture, one-half a pound of the powder dissolved in 5 or 6 gallons of water and sprinkled on the litter of a stable will deprive a cubic yard of manure of all odor, and prevent the loss of fertilizing matter.

Coal tar has also been applied, *per se*, to wheat stubble for the benefit of a root crop which was to succeed.

The use of coal tar is mentioned in this place as in many of the towns of North-Carolina it can be obtained at the gas works. It is now wasted. It is expected, also, that the kerosine oil works, which are about to be established upon Deep river, will furnish large quantities of coal tar for market.

§ 64. But to return to the consideration of peat and muck. Many questions have been raised with respect to their use, which are really superfluous; as in what kinds of soils do they produce the best results, etc. Now, this substance, if properly prepared, acts beneficially on all kinds of soils. It may be in a condition to benefit no soil; and hence, prejudices will be raised, when its failure is our own fault. But questions respecting *the best mode of preparing it for use*, are highly important.

There are many modes of composting, and undoubtedly some formula prescribing the ingredients should be adopted; and in constructing a formula, regard must be had, both to the crop it is intended for, and the condition of the soil to which it is to be applied.

In practice, muck or peat which by itself is scarcely soluble, requires an *alkali* to effect a solution of it at least.

Mr. Dana, in his Muck Manual, gives a good formula which can be followed by any person who is inclined to try it. It is composed of the following proportions:

Peat,	50 lbs.
Salt,	$\frac{1}{2}$ bushel.
Ashes,	1 do.
Water,	100 gallons.

The ashes and peat are well mixed, adding a little water to moisten the materials. This mixture lies a week, when the dissolved salt or brine is to be added and well stirred in a hogshead.

It requires stirring for a week, when it is fit for use. The brown liquid which floats above the peat, contains the whole organic matter in the salts. This is to be applied to the land it is designed for, in solution. In the course of four or five weeks, however, another substance is formed, sulphuretted hydrogen, which is injurious to vegetation. But in the mean time, repeated additions of water will furnish more soluble matter from the peat. A decided benefit is seen upon corn, onions, grass, barley, etc. A compost of these materials applied dry will be attained with less trouble, and though its effects may not be exhibited so soon, yet they will last longer. In the present state of our knowledge respecting the powers of the roots of vegetables to select or obtain nutriment, the necessity of obtaining a soluble condition of peat before its application, is not well settled; for it seems that the roots do act upon insoluble matters, and appropriate them to the use of the plant. By this phraseology, it is not meant that roots do take up insoluble material, but that they have a power of imparting solubility which water by its own action has not.

§ 65. *Fertilizers of Animal Origin.*—It will be superfluous to enumerate all the kinds which are referred to the animal kingdom. It is sufficient to observe that everything has been or may be employed for manures which has lived. All parts, all organs, hair, wool, skin, flesh and bone, help make up the list. To the foregoing we may add the animal liquids, blood, and the excrements both solid and liquid. As in the vegetable kingdom, they possess different values.

A knowledge of their composition furnishes a reason why they are so, as well as how they act.

Bone is composed of:

Phosphate of lime,	55.50
“ Magnesia,	2.00
Soda and common salt,	2.50
Carbonate of lime,	3.25
Fluoride of calcium,	3.00
Gelatine,	33.25
	<hr/>
	100.00

In adding dry bone pulverized there is added thirty-three per cent. of organic matter in gelatine.

Bones are employed in a dry state after being ground or crushed. They of course act slowly in this condition, but with excellent results. The most popular mode of employing bone, however, is as a super-phosphate, as it is called. This substance is prepared by mixing one half of its weight or its whole weight, which is better, with sulphuric acid, (oil of vitriol,) previously diluted with three times its bulk of water. The materials require repeated stirring. When the solution is effected, a pasty substance is obtained. Two modes of applying it are recommended. The first in substance, in the condition of a powder. This is obtained by mixing with charcoal powder, dry peat, saw-dust or a fine vegetable soil. If it is wished to drill in this fertilizer with the seed for a crop, as wheat, the powdered state as above may be resorted to, or if it is designed to use a solution, it is necessary to add forty or fifty times its quantity of water, when it may be applied to the crop with a water cart. The latter mode brings out results much more speedily, and as farmers are anxious to see immediate effects, the latter may afford more encouragement to use those fertilizers which belong to the first class.

§ 66. The comparative results as determined by experiments of the two forms of bones, the crushed and dissolved, should be given in this connexion. Thus, while 16 bushels of crushed bones gave ten tons and three hundred pounds per acre, two bushels of super-phosphate gave nine tons and twelve hundred pounds; the latter approximating very closely upon the former. But this statement taken literally, does not reveal to us the state of the case, for the latter has cost something for its preparation, but the difference in the long run will be found to be much less, inasmuch as the powdered preparation will continue to fertilize the soil for the next 10 years without additional expense; and yet the following practice we would recommend, viz: for all cultivated crops, as turnips, corn, oats, etc., to use the super-phosphate on the score of speedy action and immediate results; for long continued use, as for pastures and hay, the ground bones. The powder will be slowly dissolved by the aid of carbonic acid and furnish thereby a constant supply of food for years in succession. So also, as a fertilizer for vines and fruit trees, the bone in substance answers a better pur-

pose than the super-phosphate. It is no object to over manure a vine or tree; what is wanted is a steady and constant supply. When a great growth of vine and limbs is obtained by great doses of fertilizers, the wood is not perfected, and the tendency will be to develop imperfectly consolidated or unripe wood rather than fruit; there will be an over-burthen of the latter. Even uncrushed bones buried among the roots of a vine produce the best of results. In that way, the bones are, as it were, penetrated by thousands of spongioles, which, by a power not well understood, supply from these comparatively insoluble bodies, all the nutriment they require of this kind, for heavy crops.

The experiments of WOHLER show that bones are soluble in water without the aid of carbonic acid. Water which has been filtered through a mass of bones, has always contained phosphates in solution. But it appears that the quantity dissolved depends partly upon the stage of putrefaction which they have reached; and hence, it is inferred that fresh bones kept wet will furnish this important fertilizer in a mode cheaper than that which is usually pursued.

§ 67. Horn (horn core) is composed of:

Water,	10.31
Phosphates of lime and magnesia,	46.14
Carbonate of lime,	7.71
Gelatine (organic matter)	35.84
	<hr/>
	100.00

§ 68. Liquid excrements, as the urine of different animals, instead of being preserved in its liquid state, have been of late mixed with a sufficient quantity of gypsum to fix the volatile compounds, as the ammonia, and then dried to a powder; in this state it is applied to land. But it is doubtful if it has an advantage over the mixture composed of peat. Let every one consult his feelings in regard to the preparation of these bodies, especially where apparatus is not at hand, and he will readily understand why it is that the preparation and even preservation of many valuable substances is neglected; for much care and work is involved in the process when evaporation and preparation of superphosphates are talked about. But when preservation and preparations are sim-

plified, it is possible to persuade farmers to undertake it. It is not so much for want of knowledge that so much is neglected; it is because the work is presented in a shape too complicated, or requiring too much attention and labor. Guano, with all its expense, has taken everywhere, because it is ready to apply. If farmers had to cook it before it could be used, very little would have been used in North-Carolina.

§ 69. For these reasons it is believed that very few will resort to the use of tanks and distribution carts for the preservation and distribution of the liquid excrements of men and cattle. A muck or peat yard with a depression in the middle, which may be made the receptacle of offal, blood, urine, etc., will be found the most eligible mode of preserving these bodies. It is known that every thing is to go there, and all that will be required to preserve the volatile matters and absorb offensive gases, will be to use plaster and peat intermixed with a small quantity of coal tar, which can now be procured in almost every village of the State. These imperfect compost beds may be turned over with the fork from time to time in order to secure a perfect mixture. It should be spread broadcast, and the harrow used to mix it with upper soil.

§ 70. For the preparation of the fluid substances of animals, a compost with peat is probably the best which can be devised. Blood and fluid excrements mixed with charcoal or peat, the latter of which is the cheapest and most easily prepared, form with little labor and expense an excellent compost. Indeed the basis should be kept in heaps for the reception of fluid refuse matter; even the soapsuds of the wash room, which are generally wasted, should find a repository there. But let the small farmer enumerate the animal substances which might be saved in the course of a year. The blood, hair, wool, bristles, feathers, skin, old leather, woolen rags, fragments of bones, to which we may add entire carcasses of dead animals, even cats and dogs, will form a formidable mass when deposited together in the farmyard. These, when moistened or wet in a heap with ammoniated compounds, or even water, will soften, undergo a partial fermentation, and in time become as valuable as guano. The absorbant power of peat and charcoal will fix all the valuable gases.

The preservation of the foregoing substances require no cash, and very little time, and there is no necessity of attempting the

regulation of the quantity by weight or measure. Woolen rags may be deposited among the roots of vines or fruit trees; hair, bristles, old shoes and leather, etc., may have the same destination. One ton of hair, bristles and wool are worth as much as four or five tons of blood. The dry materials enumerated are fitted to those crops which are to be sustained for several years in succession, as meadow land and pasturage, while the fluid and easily decomposed kinds are better suited to the annual hoed crops. In this distribution we obtain more speedily their money value. Nitrogen is supposed to be the most important element of animal bodies. Thus dry blood contains 15.50 per cent.; dry skin, hair and horns, from 16 to 17.50 per cent. of nitrogen. Still, all these substances are rich in phosphates, and hence, their value is due in part to the latter.

To the planter, the importance of providing for the preparation or preservation of night soil, presents itself in a strong light; especially, if we can confide in the conclusions of Bousingault. According to this distinguished farmer and chemist, the liquid and solid excrements of an adult individual amount on the average to $1\frac{1}{2}$ pounds daily, and that they contain 3 per cent of nitrogen. According to this calculation, they will amount in a year to 547 pounds, containing 16.41 pounds nitrogen; a quantity sufficient to yield the nitrogen of 800 pounds of wheat, or of 900 pounds barley. The quantity is more than sufficient to fertilize an acre of land. From the foregoing it is not difficult to form an estimate of what is lost upon plantations stocked with one hundred, or any given number of laborers; or to place it in another point of view, how much might be gained by the adoption of means which shall enforce the preservation of excrements, both liquid and solid.

CHAPTER VIII.

Solid excrements. Guano. Composition and comparative value. Discrepancies stated.

§ 71. The solid excrements of animals form a well known class of fertilizing bodies of great value. Their value depends upon the food upon which the animals are supported. It may consist of matters little better than ground hay intermixed with small portions of mucus; or if fed upon corn, it is richly charged with ammonia, or perhaps still richer, if fed upon fish and animal substances. The kinds receive their designation according to their origin. Night soil, human excrement, which when dried with gypsum or lime, is sold under the name of *poudrette*. The former, in consequence of its richness, loses more of its value by exposure to the atmosphere, than any other kind. Hence arises the necessity of mixing it with absorbants, such as plaster, charcoal, peat, sawdust, etc. To these may be added the sulphuric acid or muriatic; both form with ammonia a valuable fertilizer. Muriatic acid may be sprinkled over foecal matters in the vault from a copper watering vessel. The acid should be diluted with two and a half times its bulk of water.

The products of the horse, cow and hog should be mixed together, as in that case the properties which are wanting in one are supplied by the other. Fermentation, resulting in a prepared state for use, will be secured more safely than when they are used alone. Those of the horse, it is well known, if packed into heaps, heats and is nearly destroyed. That of hogs fattening upon grain is probably richer than any other, but is far less liable to heat than the former. It is accused of imparting an unpleasant taste to roots when freely used, in consequence of containing an unexamined volatile substance.

§ 72. The excrement of birds is richer in fertilizing matter than quadrupeds, in consequence of mixture. The urate which exists in the urine of the latter, passes off with the foecal in the former. That of pigeons is in repute in Flanders, Spain and other countries in Europe. In some parts of Spain it is sold for fourpence a pound, and is used for melons, tomatoes and flower roots.

Its valuable properties are no doubt due to the grains upon which the birds feed. In Flanders the manure of one hundred birds is worth twenty shillings a year for agricultural purposes.

Equally valuable are the same products from the domestic fowl, geese and ducks, when fed upon corn. When the domestic fowl is lodged in a suitable shed, the free use of gypsum upon the floor is indispensable to the preservation of the volatile parts. It is necessary to use it with the same care as is observed in the use of all compounds which contain the elements of ammonia.

§ 73. Of the solid animal fertilizers, the most celebrated of this class is *Guano*, now generally used and is by some regarded as almost indispensable for the successful cultivation of wheat and tobacco, etc.

This substance consists of the excrements of birds, (sea fowl,) which feed mostly on fish or animal matter. The accumulation and composition is to be attributed to the dryness of the atmosphere. There are two varieties in market, the South-American from the coast of Peru, and the Mexican from the Gulf. The former is from a rainless *district*, and hence retains its soluble matter; the latter is from a district subject to rains, and hence its ammonia salts and other soluble matters are diminished to a minimum quantity. A little reflection will enable a person of information to understand their relative values, especially when it is known that the latter frequently contains from 60 to 80 per cent. of bone earth, and the former 50 per cent. of soluble matters, and rich in ammoniacal salts, and only about 23 to 25 per cent. of phosphates or bone earth. In accounting, however, for the effects of guano, we should not lose sight of their complex composition. This fact is brought out in the following analysis:

	VOELKEL
Urate of ammonia,	3.24
Oxalate of ammonia,	13.35
“ Lime,	16.36
Phosphate of ammonia,	6.45
“ Lime,	9.94
“ Ammonia and magnesia,	4.19
“ Soda,	5.29
Muriate of soda,	0.10
Sulphate of soda,	1.19
“ Potash,	4.22

Muriate of ammonia,	6.50
Water and organic matter,	5.90
Clay and sand,	28.31

This elaborate analysis is selected for the purpose of showing the complexity of composition of guano. The most valuable parts of it, it will be seen, are the ammoniacal salts and phosphatic salts. In some varieties the guano is weakened by sand and clay; it is often much less, rarely more, unless adulterated. Potash is usually regarded as existing in too small proportions to effect its value, yet it is found as a salt in this case to be larger than usual; the percentage rarely exceeding one per cent. It may be expected, therefore, that this deficiency may be observed in the course of a few years of use.

§ 74. The length of time during which guano acts is estimated variously by observers, though all agree that the guano of the rainless districts have a shorter life than those which are preserved upon a rainy coast. The reason is obvious. In this climate the former are expended in two years; the latter, as they resemble bone earth, last longer,—at least twice as long.

It must be admitted that guano, in this country, has laid agriculture under immense obligations. It has encouraged, or, indeed, inaugurated a new system, and has given that impetus to it which will never die out.

The advantages of guano in the Southern States are numerous. By its use old fields are brought into bearing immediately, and bear at once money making crops. Several years are required to resuscitate an old field in the ordinary mode of procedure. The result, then, is the saving of time. On cotton and tobacco its influence is felt strongly in securing early a good stand. Its influence is continued down to the right period for ripening, and no doubt in those cases where the proper quantity is used it ceases to grow, and the process proceeds regularly, and thereby secures uniformity; a point of the greatest importance where a high priced tobacco is the object.

The quantity of guano per acre, which is useful, seems to be tolerably well determined. Very few use more than two hundred pounds to the acre. Curious, as well as instructive experiments

are given in Johnson's elements of agriculture of the effects of *quantity* on a crop. Thus :

QUANTITY OF GUANO.	EFFECT ON THE TURNIP CROP.	ON THE AFTER CROP OF WHEAT.
4 cwt. to the acre, (Scotch.)	18 tons of good turnips.	Good wheat.
8 cwt. to the acre.	14 tons very indifferent.	Inferior.
16 cwt. to the acre.	{ Looked, when young, wonderfully well, but there was <i>little bulb</i> in the end, produce 10 tons.	{ Stubble black, grain dark, and not larger than small rice.

Guano is accused of acting injuriously when its use is protracted. The probable influence of guano, when used for several years on the same area, is to cause an exhaustion of those elements in the soil which the guano cannot supply. Potash is probably so much diminished that it ceases to furnish it to the crops. However this may be, it is evident that its use increases so largely the quantity or weight that to supply any element from the soil alone would diminish the stock or magazine in a greater ratio, and hence more speedily than ordinary crops. Hence, as the supply is derived originally from the rocks, and never can accumulate under these circumstances, though every year adds its atoms to the soil, yet it is used faster by far than it is produced ; the consequence is, the stock will be too much diminished to supply the wants after an uncertain period, and the soil will actually become poor in one or more elements necessary to the cultivated plant.

If potash is deficient in a soil, and is the result of the excessive use of guano, the addition of leached ashes will supply the deficiency ; but a mixture of well pulverized peat and ashes with guano will best supply the deficiencies of this fertilizer. It is doubtful whether the use of guano ought not to be *intermittent*. As we have said, it saves time in resuscitating old fields. If, after one or two years, guano is dismissed, and the fertility is kept up afterwards by vegetable and mineral substances composted together, the evil of exhaustion will be averted.

§ 75. In consequence of the high price of guano, an article of an inferior value is often brought to market, or else it is adulterated. Chemical changes also affect its value. It is not easy to form a judgment by ocular inspection. Those which are *brown* have undergone those changes which approximate a decomposition, which

discharges a large proportion of its ammonia. Hence, the lighter the color the less change it has undergone, and therefore the better.

A strong odor of ammonia is a good indication; if not free, a trial may be made by mixing a spoonful of it with air-slacked lime in a glass; ammonia fumes ought to be exhaled if good. Too much water is indicated by its mechanical condition. Fifty-five dollars per ton for water is a poor investment. Guano then should be dry. If much sand is intermixed it may be detected by mixing it with water in a tumbler, giving a little time for subsidence, pour off the top, repeat the operation a few times, and the quantity of sand will remain at the bottom of the tumbler. There is another experiment which it is easy to perform for the purpose of determining the quantity of sand, and if weighed, the result may be quite accurate. Heat the weighed quantity to redness, when the volatile matters, ammonia and others of that nature, will be consumed or dissipated. Dissolve the remainder in dilute muriatic acid of the shops by applying a moderate heat. The remainder will be sand or other useless earth. Elaborate analyses are too difficult and expensive to be undertaken for a moderate quantity of guano, but the foregoing may be resorted to and ought to be; for they may account for a failure, or explain more satisfactorily the results upon the crop, whether remarkably good, indifferent or bad. Much, however, must be trusted to the character of the merchant.

§ 76. The money value of animal manures cannot be accurately determined for many reasons, so much depends on the season, and circumstances under which they are employed. It is only the theoretical value which chemistry fixes. This is undoubtedly to be trusted, but it often happens that an inferior manure thus tested has a better influence than one which has the highest chemical or theoretical value. It seems to be settled that the value of a manure for a given crop depends upon the quantity of nitrogen it contains, and tables have been constructed which are designed to express this fact. It is assumed, however, that a selected example is represented by a given number, it may be 1000 or 100. This is the standard with which the others are compared, and it may be interesting to consult a table constructed upon this principle, and also occasionally useful. The following is given by Johnson:

Farm yard manure,	100 taken as a standard
Solid excrements of the cow,	125
" " " horse,	73
Liquid excrements of the cow,	91
" " " horse,	16
Mixed " " cow,	98
" " " horse,	54
" " " sheep,	36
" " " pig,	64
Dry flesh,	3
Pigeon's excreta,	5
Flemish liquid manure,	200
Liquid blood,	15
Dry do.	4
Feathers,	3
Cow hair,	3
Horn shavings,	3
Dry woolen rags,	2½

There is considerable truth, no doubt, in the foregoing table, inasmuch as experience supports it so frequently, that in the minds of many it may in fact merit a high degree of confidence. But in the example, woolen rags rank in this scale as high as $2\frac{1}{2}$, that is, $2\frac{1}{2}$ pounds of woolen rags possess as much fertilizing power as 100 pounds of farmyard manure, is doubtful; the practice of wasting them, however, should not be tolerated. According to the chemistry of pigeons' excrements, 5 pounds are worth as much as 100 pounds of farmyard manure. Reliable experience, and all that Johnson* has said of it in another place, seems to sustain in part this view, but all things considered, it is possible it also is ranked too high.

* Johnson's Elements of Agriculture, p. 213—14.

CHAPTER IX.

Mineral fertilizers. Sulphates. Native phosphates. Carbonates. Nitrates. Silicates. Ashes. Analysis of the ash of the white-oak. Composition of peat ashes. Management of volatile and other fertilizers.

§ 77. As the name implies, *mineral fertilizers* are derived from the mineral kingdom. They comprehend exactly the common elements of soil, and differ from them only in being isolated and in large quantities. Marl does not differ from the carbonate of lime in the soil; phosphate of lime is a soil element, but we procure it in quantities and intermix it with soil, and then call it a *fertilizer*. The process of fertilization consists simply in resupplying what has been removed, or adding it when it is from the start defective, or entirely absent. The farmer, in fertilization, goes to work and supplies from the mineral stores of nature what to him is wanting to make his crops grow.

§ 78. This kingdom is rich in fertilizers, the number exceeds those of both the vegetable and animal kingdoms.

As a class, they are composed of combinations of two and sometimes three elements, which, as a whole, is termed a salt, and they resolve themselves into two parts, a base and an acid; thus sulphate of lime is a salt, and consists of lime, which is the base, and sulphuric acid (oil of vitriol,) which is the acid. Virtually, it seems to be simply a base and an acid; still, lime is a compound of oxygen and calcium, and oil of vitriol of sulphur and oxygen; there is, therefore, three partners in the concern—*oxygen, sulphur* : nd *calcium*. Now in its action, it is not calcium, but *lime*; and though sulphur seems to be dissolved in certain animal fluids, yet it is generally the compound of sulphur and oil of vitriol which is found in the organic tissues. In the mind of the farmer *oil of vitriol* should not be strongly persistent; for, in combining with lime, or iron, or a *base*, this powerful substance loses its sour, caustic properties, and the gypsum formed is really one of the *gentlest, mildest and modest* bodies in the whole mineral kingdom, notwithstanding it contains that audacious consumer of all things, *oil of vitriol*.

§ 79. But we propose to consider somewhat in detail the mineral fertilizers under the heads they are ranked by writers upon agricul-

tural chemistry, and to make such remarks upon them as we may deem useful to the planter.

It need not be inferred, it appears to us, that because a substance is classed with minerals, that its mode of action differs materially from those derived from the vegetable kingdom, or that they are selected by the roots of plants and taken up by them in a different mode. In the vegetable and animal economy, they must be regarded as necessities, and cannot be dispensed with, though in quantity they are necessary only in small proportions.

§ 80. *Sulphates*, are no doubt taken up into the vegetable organism, and if decomposed by the roots or other agencies in the soil without the sulphur which exists in many plants, could not be satisfactorily accounted for. Being taken up as sulphates, the plant has power to decompose them and appropriate the sulphur and the base of the salt.

§ 81. *Sulphate of lime*, or gypsum. This substance is feebly soluble in water. In its purest crystalline condition, it is transparent, and is called *selenite*; when massive it is white or gray, and often granular, or else compact when it forms the common gypsum of agriculture, and which may be distinguished from carbonate of lime or marble by its softness, and not effervescing with acids. It is so soft as to be scratched by the finger nail.

It occurs abundantly in nature, but is never found associated with primary rocks, as granite, mica slate, gneiss, etc. This should be recollected. There is no plaster in North-Carolina unless it is associated with the sandstones of Orange, Chatham or Moore. The agalmatolite, resembling soapstone, has been mistaken for it; indeed, true soapstone is often mistaken for it. Gypsum is usually, too, accompanied with salt springs or salt, and the only indication that possibly gypsum may occur in this state are the feeble saline wells of this formation.

Gypsum appears to have a specific action on the clovers and plants of this natural order, though its activity is less on some species than others. The white clover springs up under the influence of ashes and marls, the red under that of gypsum. Applied directly to many crops, and it is difficult to see that it has benefitted them. This is the case with wheat. No one at present applies it to his crop of wheat directly, but it is first used to grow a crop of clover. This, after being fed off in part by stock, is plowed in and the wheat

then sowed. It is thought by many farmers in the wheat growing districts of New York, that the system of *clover, gypsum and wheat*, with alternate rests, is the true system of rotation, and following it the lands will remain as fertile as they ever were. This view, however, it is difficult to reconcile with the fact that several elements are removed with every bushel of wheat sold, which gypsum cannot supply; the natural result, insolvency, ought to follow, as the supply of food is limited.

Gypsum has a fine effect upon the Irish potatoe. It is sown broadcast upon the leaves or foilage when it is hoed the first time. Grass lands are also improved by it. Gypsum appears to be useful to wheat in this way; the grain is first soaked over night, and when wet is rolled in plaster which adheres to it; when it is sown, it is covered with a coat of gypsum. In this mode of use, it seems to aid in bringing it forward, or in promoting an early germination. A remarkable fact with respect to the use of it in the gypsum country of New York, is, that it acts as decidedly upon farms where gypsum exists in beds, as in other parts of the State.

In New York, gypsum has been applied with benefit to all crops but not by every individual. It is said that upon the soil of Long Island it is of no use, and it is accounted for on the ground that the soil is already supplied, or that the sea spray furnishes enough for every crop; certain it is that where the soil has $\frac{1}{2}$ per cent. it is useless to add more. The failure of gypsum is generally due to the fact that there is enough in the soil, if so, it may be determined by analysis.

§ 82. The good effects of gypsum has been explained in several ways. One theorist has maintained that it is simply a stimulant to plants, or a *condiment*. This view is overhung with doubts. The most rational theory seems to be that it furnishes both sulphur and lime, or is indeed food. Those plants whose growth is strikingly promoted by its use contain notable proportions of both sulphur and lime. Clover, for example, is one; mustard is another. I have already stated that rape seed, which is a mustard plant, contains a large proportion of the former.

The importance of gypsum, or, to be more general, the sulphates, will be best appreciated when it is stated that the most important constituents of our bodies contain and require sulphur.

Thus those parts of the blood which are known as fibrin and serum, as well as the egg of fowls, contain sulphur. This is strikingly manifest when they are in a state of decomposition, as they all give off compounds which exhale the offensive odor of a sulphur compound, well known in the rotten egg;—so also they all blacken silver. Now the bodies named above are all of animal origin, but the sulphur is not disengaged by the animal forces. It is obtained ready formed in the roots and seeds, the cereals and leguminous plants, such as peas, beans and wheat.

To account for the origin of sulphur in animal organisms, it is necessary to go back to the soils, to those salts, such as gypsum, sulphate of ammonia, etc., which contain sulphur in combination. To the vegetable organism is assigned the business of separating this substance from its combinations, and form the roots and seeds spoken of; the animal that feeds upon them obtains, without labor, the sulphur, separated and united with such compounds as we find in the blood, fibrin and serum. The vegetable kingdom thereby becomes a great labor-saving machine to the animal, as all its heavy and complicated duties are performed by it in preparing food for animals. It is not necessary that we should be able to account for changes effected by the vegetable before we can admit the foregoing views. Experiment assures us of the facts in the case. Feed a clover plant or a mustard with gypsum and the sulphur will be found in both.

§ 83. Gypsum is applied at the rate of from 2 to 3 tons per acre broadcast. When used for indian corn it is applied around the hill, and it is regarded as an eminent absorber of water as well as ammonia.

§ 84. When gypsum has been used for many years upon the same ground it ceases to produce an increase of the same crop. The ground is then said to be *plaster sick*. It occurs only with those lands where it exists in excess in the soil in consequence of its free application for a succession of years. The remedy is to suspend its use and substitute wood ashes.

§ 85. *Sulphate of ammonia*.—We place this salt in juxtaposition with gypsum, the object will be seen in the character of the subjoined remarks. As its name implies, it is composed of sulphuric acid and ammonia. We see nothing of it in the soil or elsewhere, unless we take special pains to procure or make it. Sulphate of ammonia

is manufactured from the ammoniacal liquor of gas works from the coal used in the manufacture of gas. If sulphuric acid is added to this liquor, the sulphate will be formed, and some coals yield a liquid which gives 14 oz. of sulphate to the gallon. Sulphate of ammonia is much more valuable than sulphate of lime, as it contains two important elements, sulphur and nitrogen. The nitrogen being much more valuable than the lime. Besides, the animal and vegetable sulphur compounds, fibrin, serum, white of eggs, casein, etc., contain and require both sulphur and nitrogen. Here in the sulphate of ammonia they exist, and in a salt highly soluble. The simple chemical change required by the plant is to separate the elements of water, hydrogen and oxygen, when the sulphur and nitrogen are in a condition to pass into the composition of its organism.

This salt will probably be found in the markets of this State, seeing that many of the principal villages have gas works in their suburbs, and may therefore furnish the ammoniacal liquid which may be converted into the sulphate, or it may be used directly, after being greatly diluted.

But sulphate of ammonia may be secured by all persons who keep a stable. This is effected by means of gypsum. If this substance is sprinkled often over the floors of stables, as it should be, it absorbs the ammonia exhaled from excrement of the animals. The ammonia is mostly in the condition of a carbonate. When the gypsum is used in a quantity sufficient to absorb all the escaping ammonia, a large amount of the sulphate will be ultimately formed among the excrements. The gypsum is decomposed by it, and carbonate of lime is the result as it regards the sulphate of lime, and the sulphuric acid goes over to the ammonia and forms sulphate of ammonia. The advantages of this change are, the ammonia becomes fixed, it is no longer a volatile compound, and there is really no loss attending any of the chemical ones involved in the processes.

The sulphate of ammonia, however, is quite soluble, and should not be exposed to rains out of doors until it is applied to the soil where it is wanted.

From the foregoing we learn several important uses to which gypsum may be put. 1. As an absorbent of injurious and offensive odor. 2. The formation of an important salt—important,

because it contains the elements of blood and muscle. 3. It prevents the destructive chemical changes which ammonia effects in walls plastered with mortar. The lime of the mortar being changed into a nitrate of lime by the formation of nitric acid, which results in the ruin of the plastering. Besides, coaches, harness, saddles, etc., are injured by the escape of ammonia.

The positive economy, therefore, of supplying stables with plaster is too evident to require comment.

Sulphate of ammonia costs in England, ready made, £16 per ton. About one-half cwt. is applied to the acre. It is applied to soils which contain inactive vegetable matter, and it may be mixed with wood ashes, bones, animal and vegetable manures; it may be used as a top dressing to sickly crops, which it revives and regenerates.

§ 86. *Sulphates of potash and soda* are also important fertilizers. The sulphate of soda (glauber salt) possesses a good degree of activity, and is not expensive. It is used successfully upon grasses, clover, green crops and the pea. Its quantity per acre is about one and a half cwt.

Sulphate of magnesia, (epsom salts.) Its application to the crops just mentioned is attended with satisfactory results. Magnesia is an important element in all the grains; and hence, where this earth is deficient the sulphate is an elegant compound to be used as a top dressing, for its supply.

§ 87. *Sulphate of iron* (copperas) is an astringent salt, and may be used destructively to a crop. It is a poison, and yet in small doses its use is beneficial to feeble crops, or to fruit trees. It imparts a deeper green to the foliage and appears to give vigor to unhealthy individuals. In these respects its action is similar to that upon the human frame and constitution. It has been used in a weak solution as a top dressing to grass. Two beds of an acid sulphate of iron are known in this State, one in Edgecombe county, the other in Halifax county, near Weldon. A spoonful applied to a hill of corn kills it. To prepare it for use mix with marl. It is by this agent converted into gypsum.

This substance in both cases occurs in a lignite bed, consisting of stems, leaves, and trunks of trees. The organic matter has combined in process of time with sulphate of iron. This, in its turn, or when air has access to it, decomposes and furnishes the

salt in question, and where abundant, is important, provided marl beds are accessible.

§ 88. *Native phosphate of lime.*—This mineral exists in large quantities in New Jersey and New York. The most abundant source of it is in Essex county, New York, in connexion or associated with magnetic iron, where it forms in some part of the vein from one-sixth to one-half its weight. It seems to be inexhaustible. It may be separated from the iron by washing, or by magnets; both methods have been pursued. It exists frequently also, in primary limestones, associated with hornblende, mica, felspar, etc. The great source of phosphate of lime in the soils is probably the granites and other allied rocks. It is present in lavas and other igneous rocks. But it is in minute particles, and rarely when it exists in granite and other compounds is it visible, and is only ascertained to be present by the most careful analysis of the rock.

Other sources of the native phosphate of lime are the sediments which contain fossils. Most, if not all the fossiliferous limestones, the marls of the secondary and tertiary divisions of rocks, furnish it in per centages varying from one to two and a half per cent. In the use of limestones and marls, therefore, as fertilizers, we obtain this important compound as phosphates.

Native phosphate of lime, or as it exists in soils, is quite insoluble in pure water; but for its solution carbonic acid is depended upon in an uncultivated soil. When, however, the planter employs common salt, or salt of ammonia as fertilizers, he provides in part for the solution of phosphate of lime. In sulphate of ammonia, phosphate of lime dissolves as readily as gypsum in water.

§ 89. In North-Carolina the principal source of it is in the marl region. We have never found it in the primary rocks nor associated with any of its iron ores, as in New York and New Jersey, nor in the primary limestones of the mountain belt. The marls all contain it as an organic product, for in every living being it is found both in their hard and soft parts. It is principally in the latter that it exists in the marls. The value of the marls are increased by its presence, and the striking effects of its use may often be attributed to small quantities of phosphate of lime. There are frequently small, round, hard bodies in marl beds, called *coq rolites*, which are often in sufficient quantities to pay for selection to be employed in converting them into super-phosphates by sulphu-

ric acid. They contain about 50 per cent. of phosphate of lime. They are hard, and but slightly acted upon by water and the atmosphere, and will therefore remain like rocks, unchanged, and of course benefit the soil but slightly. By the use of an equal weight of sulphuric acid they may be converted into a valuable fertilizer. They would require, however, to be broken into small pieces by a hammer and frequently stirred. A portion would remain in powder, in the form of gypsum. It may be treated like the ordinary super-phosphate of lime made from bones. Super-phosphate of lime is worth about thirty-five dollars per ton.

The practice of burning bones for the purpose of pulverizing them easily is not advisable; it is of course attended with the loss of all the organic matter, and as we believe with effects greatly diminished.

§ 90. *Carbonates*.—The carbonates are the most common of minerals. At the head of the list stands carbonate of lime, known as limestone or marble. Limestone may be known by its effervescing with acids. It cannot be scratched by the nail, but readily by a knife. Its colors are numerous—white, black, brown, flesh-colored, together with shades and tints produced by the oxides of metals, or a mixture of earth. When pure it is white and usually granular, but many limestones of a palaeozoic and mesozoic age are compact.

The limestones which are regarded pure are composed of from 96 to 98 per cent. of carbonate of lime. Its chemical constitution is:

Carbonic acid,	43.7
Lime,	56.3

Certain limestones contain also magnesia, which are best known under the name of dolomites. A dolomite is composed of:

Carbonate of magnesia,	45.8
Carbonate of lime,	54.2

When in addition to the magnesia limestones contain 20 per cent. of ferruginous clay, they form *hydraulic limestones*, which furnish a material, when burned, having the property of becoming hard or solid under water.

The term marble applies to limestones which take a polish. Other limestones are designated by the terms argillaceous and ferrugin-

ous or magnesian, according to the name of the substance which is mixed with the rock.

Limestone is nearly insoluble in pure water, 1 gallon dissolving only 2 grains, but when water is charged with carbonic acid it dissolves freely.

Limestone, when ground finely, might be applied to soils as a fertilizer, but its solution is slow to act. In the form and condition of marl, it is much more efficient.

Quicklime is sometimes important; it is best adapted to stiff clay soils, and is applied for the purpose of making them open and porous. It has also a chemical action which undoubtedly lies at the foundation of its mechanical effects, that of attacking the clay and liberating potash or the alkalies.

Erroneous opinions have been entertained with respect to the action of quicklime on animal and vegetable matter. According to Dr. John Davy, quicklime, instead of promoting fermentation, arrests it in vegetable matters, as peat for example, and as it regards its action upon animal bodies, it only attacks the cuticle, nails and hair, exerting no destructive influence upon the other tissues.

Mixed with peat and vegetable organic matter, it confers a necessary solubility, or rather, the probable action is the formation of an organic salt of lime, which is soluble. This view is sustained by the fact that in the absence of organic matter, lime exerts no perceptible effects. Quicklime should not be mixed with stable manure, unless there is added at the same time *gypsum*, to absorb the *ammonia* which the lime will be instrumental in discharging. Peat, in a state of fineness, may be employed in the absence of *gypsum*, as its absorbent powers are equally great.

The deficiency of limestone in this State is notorious. The mountains and the region of the Yadkin are tolerably well provided for. The midland counties, which take in a belt over one hundred miles wide, are destitute of it. The lower counties supply carbonate of lime for agriculture in their marl beds, and might also quicklime for building, white-washing, etc. The banks of the Neuse, 20 miles above Newbern, are well stocked with consolidated marl, well adapted in composition for quicklime.

For more than a century, burnt lime has been used in England for the benefit of the soil. It may be shown that potters and brick clay, which are stiff and unyielding, contain potash and other alka-

lies. Now, no plowing, hoeing, or mechanical operation can hasten very materially the liberation of these important elements. No mechanical means effect materially its condition; chemically, they are too slow. If we resort to the use of quicklime, in the fall spreading it over the plowed field, and allow it to act through the winter, the potash will be liberated and the whole field become porous.

§ 91. That form of carbonate of lime which is known as marl, acts more efficiently as a fertilizer than the ordinary air slacked lime. It is not simply a salt of lime alone, but a mixture of fine carbonate of lime, phosphate of lime, magnesia, iron, and some organic matter. Marl appears to be in a more favorable condition than pure lime for an easy solution.

This substance, though it appears inert to the eye, still has to be applied under the guidance of a few rules. It cannot be freely used on poor soils; those, we mean, which are destitute of organic matter. It being an absorbent of water, it is prone to act injuriously upon a crop in dry weather, or to burn it. If on the contrary, the quantity applied is proportionate to the organic matter, it will form soluble combinations adapted to the wants of the crop.

There is no poisonous matter in the marl usually, and the probability is that when in large doses, as 600 bushels to the acre, it deprives the plant of water, being in itself one of the strongest absorbents of moisture known. Where sulphate of iron and alumina are present, this astringent salt being a poison, the plant is killed by its chemical action upon its tissues. As marl is applied to the surface and rarely buried by the plow deeply, it occupies a position which commands all the moisture in a dry time.

To forestall the evils of a large application, it may be composted with peat, or any organic matter; it should always be prepared in this way. But when an over dose has been applied, the most direct mode of neutralizing its bad effects, is to plow it in deeply. It will then become mixed with a large quantity of soil, and all the organic matter of it. It will probably be changed into a fertilizing agent. As used in common cases in this State with the ordinary depth of plowing, a large body of it must effect unfavorably the whole surface, for there is only a few inches of soil for it to act upon.

§ 92. The marls of North-Carolina are not rich in lime, but still remarkable effects are obtained by their use. The following shows

the composition of a marl upon the plantation of Col. Clark, of Edgecombe:

Peroxide of iron and alumina,	6.800
Carbonate of lime,	16.100
Magnesia,	0.436
Potash,	0.616
Soda,	1.988
Sulphuric acid,	0.200
Soluble silica,	0.440
Chlorine,	0.030
Phosphoric acid,	0.200
Sand,	72.600

The complex nature of this marl is exhibited in this analysis; it shows that it is adapted to the wants of the vegetable in furnishing as large a list of those elements which the ashes of plants usually contain.

An eocene marl from the plantation of Benj. Biddle, Esq., of Craven county, gave:

Sand,	9.60
Carbonate of lime,	85.00
Peroxide of iron and alumina, containing phosphoric acid,	4.40
Magnesia,	trace.

Those marls which are thus rich in lime, are more liable to be used in excess.

§ 93. The action of the carbonates upon vegetation is usually attributed to the organic salts which are generated in the soil, as the crenates and apocrenates of lime, etc.; but in the formation of these salts it may happen that carbonic acid is set free, and in this condition becomes also a contributor of matter to the growing plant. The carbon of the carbonic acid will be retained in the plant, and the oxygen set free.

The action of marls, as a class of carbonates, upon soils is more favorable in the long run than lime, except where quick lime upon clays is required. The use of lime for many years has induced complaints, whether justly or unjustly, is not perhaps fully settled; but it is charged with exhausting the soil, and like guano, of which

we have spoken, the charge seems to be reasonable enough and to rest on the same grounds.

If the charge is sustained, we can readily see by comparing the composition of marl with common lime, that the former supplies a much greater number of fertilizing elements than the latter; indeed, it is probable that marls, like ashes, contain the most needful elements; and hence, the annual application of marl is not likely to cause an exhaustion of the soil, because of the constant additions made by its use. It rather ought to grow better yearly; for the cotton crop does not require, or does not remove as many pounds of inorganic matter as there are applied. This subject, however, we have not heard spoken of, and we have never heard of injurious effects of marl which could by any means be attributed to exhaustion, and we are confident from the nature of the facts bearing upon the subject, that where especially a compost is made of the marl, it will continue for long periods to produce good effects.

Marl seems well adapted to all those crops where the product sought is made up of cellular tissue, as the lint of cotton, the lint of flax and hemp, the fruit, such as the apple, because lime is the basis of cellular tissue. The phosphoric salts are required in the cereals, the parts sought for must be rich in sulphur and phosphorus. These last are contained in stems, lint, bark, etc., in much less proportions.

§ 94. *Carbonates of potash and soda.*—The first was anciently called the *vegetable*, and the latter the *mineral alkali*. Both, however, are derived from the mineral kingdom, but they are derived for commercial purposes from the ashes of vegetables.

Pearlash is a carbonate of potash; it is the common substance used in biscuit making, or short cake, though the bi-carbonate has displaced the old or common carbonate. Neither of these substances have been used extensively in field agriculture. The latter has become a favorite fertilizer for strawberries. Their composition and the fact of their occurrence in the ash of all plants, proves their adaptation to crops. Their cost, however, for general and extensive use, is the only draw-back to their application to corn, wheat, potatoes, etc.

§ 95. *Carbonate of ammonia* is a white salt, with the pungent odor of hartshorn. It exists in the ammoniacal liquids already no-

ticed, and is given off in stables in an impure state, or mixed with the effluvia of animal matters. It is an active fertilizer. Its true value, as in the case of other compounds of ammonia, is due to its ability to furnish nitrogen to vegetation.

As it regards the compounds or salts of ammonia for wheat and other corn crops, it seems to be established that they are essential to the increase of grain, beyond the natural produce of a soil, *aided by phosphatic fertilizers*. The experiments of Mr. Lawes, of Hertfordshire, England, gave the following results:

APPLICATION PER IMPERIAL ACRE.		PRODUCE.	
		In grain.	In straw.
1844.	Super-phosphate of lime, 560 lbs., Silicate of potash, 220,	} 16 bushels.	1,112 lbs.
1845.	Sulphate of ammonia, } Muriate do., }		
	each $\frac{1}{2}$ cwt.,	31 $\frac{1}{2}$ do.,	4,266 do.,
1846.	Sulphate of ammonia, 2 cwt.,	27 do.,	2,244 do.

The increase by the salts of ammonia upon the former crop manured by super-phosphate of lime and silicate of potash, is a striking result, and shows that the soil in order to reach its capacity for a crop of cereals, requires, besides the phosphates, those fertilizers which can furnish nitrogen. It does not prove that phosphates can be dispensed with, but only that unless nitrogenous bodies are added the crop will be less.

§ 96 — *Nitrates*.—The union of nitric acid with a base, as potash and soda, constitute *nitrates*, a remarkable class of bodies. They are all soluble and easily decomposed. When thrown upon glowing coals they deflagrate, or burn energetically with flashes of flame and scintillation.

Nitrate of potash, saltpetre, niter.—Its manufacture illustrates its formation in the soil. If the refuse of old buildings, its mortar, animal refuse, ashes, &c., are mixed in a heap and exposed to the air and watered occasionally, especially with putrid urine, they become charged with nitrates of potash and soda. Whenever, then, the circumstances are favorable, these salts will be formed; the animal matter furnishing the nitrogen which unites as it is developed with oxygen. The elements of the nitrates are found under houses, in caves, or wherever organic matter is mixed with earth protected from rains.

Both nitrates of potash and soda are highly esteemed in agriculture, though the high price of saltpetre debars it from general use. Its action upon young crops, when applied to them at the rate of one cwt. per acre, is highly favorable. Trees, the sugar cane and the grasses become fresh and green, and when combined with the phosphates is one of the most important fertilizers, as it contains in combination, the most important elements which the crop demands—nitrogen, phosphoric acid and potash. Nitrates increase the foliage of plants; and hence, for grass, or meadows, they are particularly and immediately serviceable.

The *nitrate of soda*, sometimes called soda-saltpetre, is a native product of Peru and Chili, being formed in the earth in those sections where rain rarely falls.

§ 97. *Chlorides*.—The compounds consist of chlorine and a base, as sodium, uniting directly, or without the previous union of the base, with oxygen. The most common, and to the agriculturist the most important, is *salt*, or the common table salt. It is a native production in many countries, occurring in solid beds, which have to be quarried like rock. The bed near Cracow, Poland, is supposed to extend 500 miles, and is 1,200 feet thick. Salt springs are common, but the ocean is the great reservoir of salt. It contains about four ounces to the gallon of water. Salt has been and is variously estimated as a fertilizer. It strengthens the straw of the cereals, and is supposed to increase the weight of the grain. It is more important in land, or at a distance from the sea, than upon the shores.

§ 98. *Chloride of ammonia*.—Sal ammoniac of the shops. Muriate of ammonia. This well known salt has proved by experiment, to exercise a beneficial influence upon crops. It is, however, too expensive in its pure state, to be economically employed in agriculture. A solution for steeping seed corn is recommended; it hastens germination, and is supposed also to add to the luxuriance of the crop.

§ 99. *Silicates*.—Pure silica, or pure flint is strictly an acid, but it is so insoluble that under common circumstances its real character is disguised. But put finely ground flints into a solution of potash and the silica unites with the potash, and forms a soluble *silicate of potash*. Silicates, then, are bodies constituted like other salts, having a base united with soluble flint. The silica may be

separated from its combination by the addition of an acid, and the silica will form by itself a gelatinous mass, *which is a silicic acid with water*. If this gelatinous mass is dried, the silica becomes gritty and is really now what is called quartz, and is no longer soluble.

Now in the soil there is always a small quantity of soluble quartz, and certain plants must have it in order to give strength to their stems. All the cereals and grasses are furnished with this substance, which is mainly deposited upon the outside; which both protects and strengthens the straw. It is not properly a nutriment, but in the organization of the grass tribes it is an essential element; wherever the soil is deficient in soluble silica, the straw of the grain is weak. The celebrated German Chemist, Liebig, proposed the use of special manures, consisting of silicates mostly, as a fertilizer for wheat, rye, oats, turnips, &c. His special manures, however, have failed to meet the expectations of his friends. They failed on the ground that mineral substance alone, and by itself, is insufficient to supply the wants of vegetation. The failure has an important bearing on our practical views, showing clearly enough that organic matter is essential to plants. It does not prove that what Liebig proposed was useless and unnecessary, but that he did not go far enough; he fell short of a sound theory by excluding from his potent fertilizers *vegetable matter*, from which the organic acids are formed.

The silicates of rocks are not wholly insoluble, they are attacked by water and carbonic acid, and by their joint action are dissolved. It is by their action that the soil is furnished with soluble silicas. That such a result is possible is shown by the action of rains and carbonic acid upon window glass, while a silicate which becomes gradually opaque, especially in stables, where carbonic acid escapes. Distilled water alone dissolves glass. The tumblers used in carbonated spring water are corroded by carbonic acid.

Straw furnishes silicates, when spread over the surface of fields, but, if burnt, the silica becomes insoluble. Hence, straw should be applied without change. Its organic matter is also put to use. Straw spread upon meadows for grass is an excellent application.

§ 100. *Ashes* contain a large number of fertilizing elements; indeed it may be presumed that whatever an ash contains performs something in the economy of the vegetable which yields it.

The ash of *sea weeds* is the kelp of commerce. It contains potash, soda, lime, silica, sulphur, chlorine, iodine, etc. The existence of these elements in marine plants throws light on their action upon vegetation.

Wood ashes contain, among other things, *pearlash*, or carbonate of potash. The composition of ashes depends upon the tree and the part burned; the bark furnishes an ash whose composition differs from that of the wood or the leaves.

The ash of the bark and wood of the white oak contains the following substances:

	SAPWOOD.	BARK.	HEARTWOOD.
Potash,	13.41	0.25	9.68
Soda,	0.52	2.57	5.03
Sodium,	2.78	0.08	0.39
Chlorine,	4.24	0.12	0.47
Sulphuric acid,	0.12	0.03	0.26
Phos. of peroxide of iron, lime and magnesia,	32.25	10.10	13.30
Carbonic acid,	8.95	29.80	19.29
Lime,	30.85	54.89	43.21
Magnesia,	0.36	0.20	0.25
Silica,	0.21	0.25	0.88
Soluble silica,	0.80	.25	0.30
Organic matter,	5.70	1.16	7.10

The tree furnishing the ash grew upon a clay soil rich in lime. It will be observed that the bark is much richer in lime than the wood, while the wood is richer in phosphates; and the richest part of the wood is that of the outside. The same result is shown in the distribution of potash; the outside wood contains more than the heart wood, and in the bark it is reduced to a minimum quantity, only 0.25 per cent. These are leading facts in the distribution of the elements of growth in the vegetable kingdom, and we may feel assured that it is not an accident that they are thus distributed. It is probable that lime distributed to the outside is best adapted to the protection of the vegetable tissues. The newest parts, as the outside wood, derives a part of its elements from the inside, especially the phosphates, which are no doubt transferred by the circulation. The law which has been already expressed, holds good in all the correct analyses of the parts of trees; their distribution is

upward and outward, tending continually to the new parts which are being developed.

§ 101. The ashes of peat differ in composition according to the nature of the plant from which peat is formed. There will also be changes in the composition of peat which is old, when compared with a new growth of it.

The following analysis by Johnson, shows the general composition of peat ashes :

Chloride of sodium,	0.41
Phosphate of lime,	2.46
Sulphate of lime,	18.66
“ magnesia,	1.68
Carbonate and silicate of magnesia,	6.32
“ “ potash and soda,	5.32
“ “ alumina,	11.63
Oxide of iron,	9.18
Silica,	15.55
Insoluble matter, sand, &c.,	7.94
Carb. acid, coal, etc.,	10.85
	<hr/>
	100.00

In this sample the gypsum is much greater than usual, and the silicate of alumina is foreign matter, as alumnina is never a true ash product.

§ 102. On reviewing the general principles which are set forth in the preceding account of fertilizers, we may understand that it is not sufficient to apply to the soil fertilizers in their simple state, and at random, provided the planter determines to derive from them the greatest benefit. We are unable to increase their power, but their elements of fertility may be preserved or prolonged by a suitable management, which in reality would be equivalent to an increase of power. The most active and valuable ones require the most particular attention. Guano, for example, requires careful manipulation, and when it is once determined how this volatile compound is to be treated, it furnishes a rule for others whose composition is closely related to it.

Of the different fertilizers, we may arrange them into four orders.

In the first, we may place those which contain a notable percentage of ammonia, in such a state of combination that it is freely exhaled, or exists in a volatile condition.

In the second, those which by chemical changes form ammonia, and which also become volatile.

In the third, we may place the fixed salts; and

In the fourth, those compounds which consist of carbonaceous matters, and possess also the character of comparative stability under ordinary conditions. The latter order is well adapted to a general use with the preceding, either as an absorbent of the volatile matter, especially ammonia, or with the salts, with which they form combinations consisting of an organic acid and a mineral base.

The probability is that the best results are secured by mixing our organic with the inorganic in every instance. By adopting this course, the time when soils will begin to exhibit signs of exhaustion will be far in the future, or certainly postponed indefinitely.

CHAPTER X.

The quantity or ratio of the inorganic elements in a plant may be increased by cultivation. Source of nitrogen. Specific action of certain manures, particularly salts. Farm yard manure never amiss. Use of phos. magnesia. Special manure sometimes fails, as gypsum.

§ 103. While it is well established that the organs of plants possess each their own component, inorganic elements, it is equally well proved that their quantity may be increased or diminished by modes of cultivation. The organs still maintain their differences in respect to the ratio of the component elements under any system of culture.

As an illustration of the changes which may be produced by modes of cultivation, we may cite wheat. If, for example, it is

manured with the ejecta of the cow, it furnishes a smaller proportion of gluten than if manured with fertilizers richer in ammonia. When manured as above, the berry contained 11.95 parts of gluten, and 62.34 of starch. When manured with human urine, which is rich in the elements of ammonia, it yielded 35.1 of gluten; nearly three times as much as in the former case. Gluten determines the weight of the grain, and, to a certain extent, its use. The flour, which is suitable for the manufacture of maccaroni, must be rich in gluten. Certain soils produce, without fertilizers, a heavy wheat rich in gluten. This is a fact with the wheat of Stanly county, N. C., which weighs 68 lbs. to the bushel, probably the heaviest wheat ever sent to market.

§ 104. The important principle contained in the foregoing facts have a practical bearing; they determine the practicability of raising a crop adapted to a particular use, independent of the influence of climate, and hence of increasing its value.

In relation to the subject of ammonia, much thought has been given, and many experiments made to settle the question of its source. As nitrogen forms a large proportion of the atmosphere, it was natural to infer that the atmosphere might furnish this element directly to the leaves or to some other part of the plant. This view has not been adopted, and it is moreover well settled that ammonia exists in the air in small quantities and is dissolved in rain water; it is also contained in fresh fallen snow, but notwithstanding its presence in the atmosphere, it is essential to its reception in the plant to combine it with an organic acid, which nature effects in the soil, which contains organic matter, in the condition of acids, as the cerenic and apocrenic.

Certain other saline manures exercise a specific action upon crops. Those of ammonia are, perhaps, the most general in their effects; all crops continue to grow longer under the influence of these salts, or continue in a growing state until late in the season. Nitrate of soda has a similar effect. With respect to their application to certain crops, which we wish to have ripened within a certain period, as *tobacco*, for example, they would not be adapted to it; it would cause the plant to continue growing until frost; it would be in the unripened state, or only ripened in part; and hence the tobacco would command only an inferior price in market.

§ 105. Certain salts promote the growth in perfection of particular parts of vegetables. Thus when the straw of wheat or rye is weak, theory would lead to the use of the soluble silicates of lime or potash, for the purpose of supplying the silex where it is required. The practice is attended with good results. When the ear is not well filled, the phosphates are resorted to, as it is here that this salt is deposited in the greatest quantity. The leaves of the vine are best developed by carbonate of potash; and the phosphates again develope or go to the fruit.

Other fertilizers seem to be adapted in certain conditions at least to all crops. Farm-yard manure never comes amiss, provided it has been subjected to such physical and chemical changes which the crop requires. It is not always proper to apply it fresh or in the condition of long manure. Gypsum is specially adapted to the growth of red clover, and ashes and marl will bring up white clover in places where it had not been known to grow perhaps at all.

Phosphate of magnesia has been praised for potatoes, and the super-phosphate of lime is the best dressing for turnips.

But even the foregoing well authenticated facts are somewhat local; for certain reasons not well ascertained, some of the striking effects of these special results, do not occur in another section of the country, or at least are far from being so striking. It is never possible to predict the effects of gypsum on crops, though its properties must hold good everywhere; that is, must always act as an absorbent of ammonia and water, but still it is said to fail at times as a fertilizer. In England it is not particularly praised, while in this country there are only a few districts where it is not attended with benefit to the crop. Natural fertilizers, however, do not stand alone in their failures. Those manufactured for a particular end are found to fail frequently. Failures no doubt occur by a misapplication of the substance; it may be given in excess and become a destroyer. It may fail from an unfavorable season, and may also fail from adulteration or for want of a natural purity in composition as a great excess of inert and valueless substance with which it is intermixed.

CHAPTER XI.

On the periodical increase of the corn plant. The white flint, together with the increase of leaves and other organs. The proportions of the inorganic elements in the several parts of their composition. The quantity of inorganic matter in an acre of corn and in each of its parts. Remarks upon the statistics of composition.

§ 106. The changes which a plant undergoes during its period of growth are worthy of attention. For the purpose of illustrating the development of vegetable organs, we have selected the Indian corn or maize; and as the growth of the foliage exhibits the views we wish to bring out, we have tabulated the weekly increase of the leaves in weight, and the amount of water they contain, together with the quantity of ash the whole weight furnishes. The observations begin in July and are continued until August 11:

	TIME: JULY 5.	JULY 12.	JULY 18.	JULY 29.	AUGUST 4.	AUGUST 11.
Weight in grains,	367	698	886	2294	2810	1642
Water,	304	568	869	1835	2179	1227
Ash,	6.75	756	8.32	41.58	58.97	36.59

This table shows the rapid increase of weight in the leaves from July 18 to August 4, after which the leaves rapidly lose their weight, by supplying, no doubt, nutriment to the corn, which is then filling up. There is in most organs a growth which attains its maximum at a certain period, when it seems to retrograde. This view, however, applies only to the subsidiary organs. All the energies of a plant are concentrated on the production and perfection of seed. The stalks of corn increase in about the same ratio as the leaves.

STALKS.	TIME: JULY 5.	JULY 12.	JULY 18.	JULY 24.	AUG. 4.	AUG. 11.
Weight in grains,	100		1084	3041	5219	4597
Water,	92		987	2671	4625	3832
Ash,	94		8	16.82	29.48	51.25

§ 107. The stalk attains its maximum growth between by the 4th and before the 11th of August, and begins to yield up its nutriment to the ear, which is rapidly forming. By the 23d of the

month, a week later, they weigh 2,237 only. In the selection of specimens, it was attempted to employ such as were equally advanced and of equal size, as possible.

§ 108. The increase in weight of the white flint corn during periods of one week and during the period embraced in the foregoing observations, will be expressed in the following tables and remarks.

On the 28th of June the corn was 18 inches high, and had increased in height during the preceding week $7\frac{1}{2}$ inches:

Average weight of each plant,	84.15	grs.,
Increase in weight,	62.05	"

July 5th, hight 26 inches; increase in hight, 8 inches:

Weight of one plant,	237.5	grs.,
Increase of weight during the week,	152.35	"
Average increase of one plant per day,	21.76	"

July 12th, hight of plants 35 inches; increase 9 inches:

Weight of one plant,	861.9	grs.,
Increase per week,	432.7	"
" day,	61.81	"

July 19th, hight 43 inches; increase in hight 8 inches:

Average weight of each plant,	875.48	grs.,
Increase during the week,	177.19	"
Increase per day,	25.31	"

July 26th, hight 49 inches; increase in hight 6, or one inch per day:

Average weight of each plant,	2039.	grs.,
Increase per week,	1191.6	"
Increase per day,	170.22	"
Increase per hour,	7.09	"

August 2d, hight 58 inches; increase 9 inches:

Average weight of each plant,	3308.	grs.
Increase in weight per week,	1269.	"
Average per day,	181.	"
Average per hour,	7.55	"

August 9th, hight 65 inches ; increase during the week 7 inches :

Average weight of each plant,	38.27	grs.,
Increase during the week,	286.	"
Increase per day,	11.92	"
Increase per hour, .....	.49	"

August 16th, average hight 72 inches; increase 7 inches:

Average weight of each plant,	6780	grs.,
Increase of weight during the week,	2953	"
Increase per day,	436	"
Increase per hour,	18.16	"

August 23rd, average increase in hight of plants for the week .76 inches; increase in hight during the week 4 inches:

Average weight of each plant,	8170.	grs.,
Increase in weight,	1389.	"
Average per day,	198.	"
" per hour,	8.27	"

August 30th, average hight 78 inches; increase in hight during the week 2 inches:

Average weight of each plant,	10.580	grs.,
Increase during the week,	2.409	"
Increase per day, .....	.344	"
" per hour,	14.34	"

September 6, average hight of each plant, 78 inches. No increase in hight for the week:

Average weight of each plant,	12.917	grs.,
Increase during the week,	2136.	"
Increase of weight per day,	305.	"
Increase of weight per hour,	12.72	"

On comparing the parts of the plant with each other at this stage of growth, we find they hold the following proportions to each other:

	WEIGHT.	
Tassel,	147.98	grs., 2.29 per cent.
Upper part of the stalk,	1128.8	" 0.63 "
Lower part of the stalk,	2084.	" 1.13 "
Sheaths,	1239.	" 1.42 "
Leaves,	1970.	" Lost.
Ear stalks,	1217.	" .48 "
Husks,	2484.	" 1.65 "
Kernels,	926.	" .488 "
Cob,	1255.	" .354 "

The composition of the ash of the leaves and sheaths at this stage of growth is as follows:

	LEAVES.	SHEATHS AND HUSKS.
Potash,	10.15	8.76
Soda,	22.13	19.68
Lime,	3.38	1.20
Magnesia,	2.38	2.02
Earthy and alkaline phosphates,	14.50	13.80
Carbonic acid, ..	3.50	4.14
Silicic acid,	36.27	38.10
Sulphuric acid,	5.84	6.36
Chlorine,	1.63	4.34

At a later period, that of October 18th, when the corn was ripe, the leaves and sheaths were composed of:

	LEAVES.	SHEATHS.
Potash,	8.33	7.48
Soda,	8.52	12.44
Lime,	4.51	2.13
Magnesia,	0.86	0.79
Phosphates,	6.85	9.75
Silicic acid,	58.65	51.25
Carbonic acid,	4.05	trace.
Sulphuric acid,	4.88	12.27
Chlorine,	2.66	2.96

§ 109. The stalks of the period were composed of:

	STALKS.
Potash,	16.21
Soda,	24.69
Lime,	2.84
Magnesia,	0.93
Phosphates,	16.15
Silicic acid,	12.85
Carbonic acid,	1.85
Sulphuric acid,	10.73
Chlorine,	10.95

The phosphates of the leaves of the October's growth are less than in those of September 6. The amount of the alkalies have apparently diminished, though it is possible that comparisons may be fallacious, seeing that the results are obtained from the analysis of different plants, growing also on different hills, and may prove to be due to other causes than those connected with the distribution of inorganic matter by the influence of the organs. Our theory is, with respect to the distribution of the inorganic matter, that the leaves furnish to the grain a part of their store, or that it is transferred from the leaf to the grain.

The husks are composed of:

	HUSKS.
Potash,	3.51
Soda,	9.82
Lime,	0.45
Magnesia,	0.07
Phosphates,	26.25
Silicic acid,	47.65
Sulphuric acid,	6.67
Chlorine,	5.56
Carbonic acid,	trace.

For feeding stock, horses, cows, etc., the advantages of one organ over the other are not very great, so far as the inorganic matter is concerned. The silicic acid or silica is the greatest in the husks, which may be regarded as the useless part; but it happens that the *phosphates* are greater in the husks than the leaves at this stage; but again, the potash and soda are greatest in the leaves.

In the sheath and leaves, taken at the same date, Sept. 6, there are but slight differences in composition in the two organs, leaf and husks. A comparison of the composition of the leaves and the grain of the white flint corn of August 22:

	LEAVES.	GRAIN.
Potash,	12.76	23.92
Soda,	8.51	22.59
Lime,	6.09	0.16
Magnesia,	1.25	2.41
Alkaline and earthy phosphates,	19.25	35.50
Silica,	50.55	9.50
Sulphuric acid,	4.18	4.38
Chlorine,	9.76	0.40

The alkaline and earthy phosphates, potash and soda, exist in large proportions in the grain, while the silica is reduced to a minimum, and is confined to the cuticle.

§ 110. Analysis of the grain and cob of the 8 rowed yellow corn of the same ear :

	GRAIN.	COB.
Potash,	27.35	37.85
Soda,	5.79	1.83
Lime,	trace.	0.24
Magnesia,	trace.	0.53
Earthy and alkaline phosphates,	52.75	36.57
Chlorine,	4.10	2.95
Sulphuric acid,	3.48	9.20
Silex,	1.73	10.76
Per centage of ash, .....	.62	.40

As it regards the value of the cob for nutriment so far as its inorganic matter is concerned, it is plain that it has a certain value and should not be lost. Cob ashes are known to be rich in the alkalies even when guided only by taste ; but at this stage the potash amounts to 37 per cent. and the phosphates to 36 per cent. and the silica to only ten per cent. But the per centage of ash is small in the cob, scarcely amounting in any case to more than one-half of one per cent.

§ 111. The husks of this variety of corn and which belong to the same stage of growth, are composed of :

Potash,	21.85
Soda,	2.04
Carb. of lime,	0.27
Magnesia,	0.23
Phos. of lime, magnesia and iron,	29.43

Chlorine,	1.11
Sulphuric acid,	11.11
Silica,	32.13

From observation and experiment it appears highly probable, that the 8 rowed yellow corn is one of the most valuable for feeding properties. Its parts are all of them rich in inorganic matter.

§ 112. Upon an acre of corn we raise about 18,700 plants. These plants will contain 466.80 lbs. of inorganic matter. This inorganic matter will be distributed to the parts of plants in the following amounts:

Tassels,	64.239 grs.,
Stalks,	525.525 "
Sheaths,	594.962 "
Leaves,	1.195.845 "
Silks,	25.284 "
Husks,	434.091 "
Cobs,	264.600 "
Grain,	480.690 "

3.585.036 grs.,=7468.82 oz.=466.80lbs.

Of this quantity the leaves and sheaths will contain of:

	LEAVES.		SHEATHS	
Silica,	82.681 pounds,		39.667 pounds,	
Earthy phosphates,	29.273 "		7.546 "	
Lime,	9.400 "		1.581 "	
Magnesia,	1.910 "		0.589 "	
Potash,	19.704 "		5.571 "	
Soda,	13.142 "		9.262 "	
Chlorine,	15.072 "		2.202 "	
Sulphuric acid,	6.461 "		8.928 "	

The weight of the inorganic matter of the grain and cob will be:

	GRAIN.	COB.
Silica,	5.939	4.678
Earthy and alkaline phosphates,	22.187	8.229
Lime,	0.187	0.103
Magnesia,	1.506	0.309
Potash,	14.950	12.315
Soda,	14.118	2.034

Chlorine,	0.309	0.045
Sulphuric acid,	2.740	0.118

The stalks of one acre will contain :

Silica,	8.789
Earthy phosphates,	10.362
Lime,	1.928
Magnesia,	0.640
Potash,	11.087
Soda,	17.094
Chlorine,	7.491
Sulphuric acid,	7.382

64.773 pounds.

§ 113. The several amounts of the inorganic elements will stand as follows :

	LES. OZ. DECIMAL PARTS OF AN OUNCE.
Silica,	173.12.496
Earthy phosphates, etc.,	93. 3.984
Lime,	13. 9.248
Magnesia,	5. 0.752
Potash,	66. 2.944
Soda,	61.15.184
Chlorine,	28. 7.328
Sulphuric acid,	29.11.696
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	471.15.632

§ 114. The foregoing statistics of the corn or maize elements show that it is an exhausting crop. This is agreeable to the opinions of the best informed farmers.

The maize crop is remarkable for bearing high culture without danger of an excessive growth of stalk or leaves. In this respect it is quite different from wheat or oats. The rich lands of the eastern counties of North-Carolina produce great crops of maize, but when wheat is put upon them, the crop consists of straw instead of grain, which is even of a poor quality, so far as it is produced.

Again, the foregoing statistics show the actual amount which each part contains, and what it removes from the soil. An infer

ence from all these facts is, that it is not sufficient to supply the phosphates upon an exhausted soil to restore it to fertility; the quantity of potash, soda, etc., which may be and probably is combined in part with silica, shows that the soluble silicates will be required in the list of fertilizers. Plants require *foliage elements*, as well as *grain or seed elements*; for undoubtedly the perfection of the seed is dependent, in a great measure, upon the perfection of the foliage. This precedes, or is developed first, and when we find it green and luxuriant, we predict a fine crop of grain.

CHAPTER XII.

Value of foliage for animal consumption depends upon the quantity of two different classes of bodies: heat producing and flesh producing bodies. These two classes are the proximate organic bodies, and are ready formed in the vegetable organs. Proximate composition illustrated by two varieties of maize. Their comparative value. Analysis of several other varieties of maize for the purpose of illustrating difference of composition as well as their different values. Composition of timothy, etc.

§ 115. The true value of foliage is determined from the quantity of the proximate elements of certain organic products developed or produced in the organs and seeds of many plants, particularly those which are in common use for feeding animals. Of these elements starch, sugar, gum, dextrine, gluten, legumen, casein, albumen, are the most important. The list is naturally divisible into two classes. The four first form a class which have been called respiratory elements, and furnish the body with heat and fat; they are destitute of nitrogen. The remainder, of which gluten stands at the head, are the flesh and strength producing elements, and are known to contain nitrogen, and hence are sometimes called *nitrogenous elements*. The first class meet a special want in the animal economy, that of supplying it with heat, and when they are taken in larger quantities than the system requires, they accumulate around certain parts in the form of fat.

It is evident that as the economy of the animal system requires not only heat but strength and muscle or flesh, and as these are furnished from plants in the first place, that any given plant is valuable for food in proportion to the quantity which these two classes of elements are contained in the vegetable or which it can furnish. In order to determine the value of a plant, then, these different classes and individuals of the class are separated or isolated from their natural combinations, or in other words they are analyzed. As an example we may take the composition of maize, which will show the proximate composition of the grain. Its ultimate analysis would be, resolve the proximate bodies into the elements, carbon, oxygen, hydrogen and nitrogen. The proximate elements exist ready formed in the *grain, leaf or stem*, and they are separated from the fibre or cellular tissue by water, alcohol, ether, weak alkaline, solutions, etc. The grain, then, in its proximate elements of ready formed bodies, contains :

	S EOWED WHITE FLINT.	WHITE KENTUCKY DENT CORN.
Starch,	57.47	50.92
Oil,	2.55	0.64
Dextrine or gum,	4.01	3.08
Sugar and extractive,	13.21	13.80
Albumen,	2.27	4.44
Casein,	0.39	0.80
Gluten,	1.67	0.72
Fibre,	6.07	9.70
Water,	11.46	12.22

The heat producing bodies in the two varieties are :

	FLINT.	KENTUCKY CORN.
Starch,	57.47	50.92
Oil,	2.55	0.64
Gum,	4.01	3.08
Sugar,	13.21	13.80
	<hr/>	<hr/>
	77.24	68.42
		Heat and fat producing bodies.

While the flesh producing are in the

	FLINT CORN.	KENTUCKY CORN.
Albumen,	2.27	4.44
Casein,	0.39	0.80
Gluten,	1.67	0.72
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	4.33	5.96

In the Kentucky corn the flesh producing bodies exceed those in Flint corn.

To give another analysis of corn for the purpose of showing a still greater difference in the varieties often cultivated, we select the small blue corn used for parching. It contains:

Starch,	42.56
Oil,	5.30
Sugar and extractive,	15.32
Gum,	7.52
Albumen,	5.00
Casein,	2.04
Gluten,	4.78
Fibre,*	8.56
Soluble in fibre by potash,	8.55

The fine parching properties of this corn are due to the large quantity of oil present in the grain. Another variety of *pop corn*, the lady finger, contains nearly 7 per cent. of oil.

The sweet corn is still more remarkable in its composition, thus it contains:

Starch,	11.60
Oil,	3.60
Sugar,	6.62
Dextrine or gum,	24.82
Extract,	8.00

* Fibre is the hard stringy part of vegetables; it is wood or the fibre of flax; cotton lint is the purest form of fibre; bruise or beat wood or straw or grain, dissolve out by water, ether, alcohol and a weak solution of pearlsh all that can be and the part remaining is fibre; it exists in the excrements of cattle and horses, and forms much of their bulk.

Gluten,	4.62
Albumen,	14.30
Casein,	5.84
Fibre,	11.24
Water,	10.81

The starch in this variety is reduced to a minimum quantity, and the gum or dextrine is increased to the maximum known in maize. The gum, no doubt, replaces in part the starch, and it is this element which causes the great shrinkage in the kernel, from which we should very naturally infer that the corn was gathered in an unripe condition. This, however, is not the fact. But the sweet corn is eminent for its flesh producing elements when it is seen to contain 14 per cent. of albumen and 5 per cent. of casein.

§ 116. The value of the corn leaf, or fodder, as it is called, is more accurately ascertained by submitting it to an organic proximate analysis. When thus treated timothy and corn leaf are found to be composed of:

	TIMOTHY.	CORN LEAF.
Fibre,	68.14	60.00
Wax,	2.80	undetermined.
Sugar extract and dextrine,	8.20	10.00
Albumen,	1.89	0.22
Casein,	2.34	1.60
Water,	12.30	10.17

The insoluble fibre makes the bulk of the leaf, and serves in the animal economy to fill up space, or give a proper degree of tension to the membranes. The albumen and casein are nearly as large in corn leaf as in the best of grasses. The red top, a favorite hay, is composed of:

Fibre,	65.00
Wax,	11.62
Resin,	3.08
Extract and sugar,	9.00
Albumen,	1.49
Casein,	1.80
Water,	10.00

§ 117. It will be observed that the insoluble matter, or fibre, in the three kinds in the above examples, timothy, red top and corn leaf, are really the same, or nearly so. All the other bodies, classed as *nutritive and fat producing*, make up the remainder. They differ in quantity in these individual specimens, yet, it is probable, that for feeding stock, as they generally grow, sometimes on rich and sometimes on poor soil, they cannot differ essentially. One, in its general run, will support as much stock as the other, for it will be observed that cultivation, or no cultivation, changes the character of the crop. If, however, we compare the foregoing compositions with another species, which grows naturally on a cold wet soil we shall perceive a great difference.

For example, a carex (a swamp grass) collected just before it was to blossom was found to be composed of:

Fibre,	86.20
Wax,	2.00
Albumen,	2.84
Casein,	trace.
Resin,	0.47
Extract and sugar,	6.60

The greatest part of this grass is unnnutritious fibre, still it is not deficient in albumen, but both classes of bodies are reduced to a low per centage. We find less than 15 per cent. of the heat and flesh producing bodies combined.

Composition of the common garden pea, rice and wheat, so far as their proximate organic elements are concerned :

	PEA.	RICE.	WHEAT.
Water,	14	13	15
Starch,	42	70	42
Sugar and gum,	6	4	9
Nitrogenous substances,	24	7	15
Oil,	2	1	2
Woody fibre,	9	4	15
Ash,	3	1	2
	—	—	—
	100	100	100

Rice contains a larger amount of stalk than wheat or corn, but in nitrogenous substances it is less than one-half of that in wheat, and in the pea they exceed the rice more than three times.

CHAPTER XIII.

Composition of tuberous plants with respect to their nutritive elements. Irish potatoe. Sweet potatoe. Their nutritive values compared.

§ 118. The family of vegetables which rank next in nutritive value to the cereals are the tuber bearing plants, potatoes, sweet potatoes, turnips, etc. They owe their value mostly to the presence of the same heat and flesh producing bodies as the grains. The inorganic elements are the same as in the cereals and grasses, but their proportions differ somewhat from them. The ash of the mercer potatoe, which is, in general repute, is composed of:

	MERCER POTATOE.
Silica,	4.40
Earthy and alkaline phosphates, consisting of lime, magnesia and iron,	39.50
Lime,	0.15
Magnesia,	0.80
Potash,	14.26
Soda,	24.92
Sulphuric acid,	6.25
Carbonic acid,	trace.

A curious fact which we brought out in the analysis of the potatoes is the difference in the proportion of both water and ash of the ends, and besides the rose end, if planted, will form potatoes earlier than the heel end. They are composed of:

	ROSE END.	HEEL END.
Water,	83.83	75.17
Dry matter,	16.16	24.82
Ash,	0.72	0.43

§ 119. The proximate organic analysis of the tuber of the mercer gives us more information, as it regards its nutritious qualities. It contains:

Starch,	9.71
Fibre,	5.77
Gluten,	0.20

Fatty matter,	0.08
Albumen,	0.24
Casein,	0.50
Dextrine,	0.72
Sugar and extract,	3.93

The water of the potatoe amounts to about 80 per cent. The starch is less in this sample of mercer than in the early June, which contains 13.37 per cent. As it regards flesh producing bodies all the potatoes rank low.

§ 120. The following analysis of the sweet potatoe will enable the reader to compare it with the Irish as an article of food, particularly with regard to its flesh producing qualities. The ash is composed of:

Silica,	1.85
Earthy and alkaline phosphates,	22.10
Carbonate of lime,	0.60
Magnesia,	0.50
Potash,	49.36
Soda,	5.02
Sulphuric acid,	1.20
Chlorine,	4.09
Carbonic acid,	15.72
	<hr/>
	98.91

The tuber contains:

Water,	69.51
Dry matter,	30.48
Ash,	1.09

§ 121. The proximate organic analysis gave:

	SWEET POTATOE.	TUENIPS.
Starch,	19.95	7
Sugar and extract,	5.80	2
Dextrine,	0.75	
Fibre,	1.85	2
Matter dissolved by potash,	2.10 }	
Albumen,	5.90 }	1½
Casein,	1.03 }	
A body that resembles balsam,	0.22	½ oil.
Water,	96.56	86

The foregoing analyses serve to confirm or rather to agree with the common opinion, that the sweet potatoes rank considerably higher in the scale of nutriment than the Irish; they furnish more of the flesh producing bodies; they contain less water. Both are rich in potash. The per centage of ash appears low, but in both it is extremely fusible and difficult to obtain in a pure condition for weighing, as it is very liable to be caustic. The ash of the leaves and stems is composed of:

Silica,	23.60
Earthy phosphates,	28.57
Carbonate of lime,	15.00
Magnesia,	none.
Potash,	18.51
Soda,	9.46
Sulphuric acid,	2.78
Chlorine,	2.09
Per cent. of ash in leaves,	2.63
" " stems,	1.73

The sweet potatoe compared with the turnip used so largely for fattening stock in England, is far superior in every point of view.

CHAPTER XIV.

Composition of the ash of fruit trees; as the peach, apple, pear, Catawba grape. Amount of carbon or pure charcoal which some of the hard woods give by ignition in closely covered crucibles.

§ 122. Persons who cultivate fruit trees may wish to know the composition of the inorganic matter or ash which the different parts furnish. The following analysis will fulfil in part, at least, their wishes. The peach being a very important fruit tree in this State, is selected from among many which have been made. The ash of the parts of the peach is composed as follows:

	BARK.	WOOD.	LEAVES.
Potash,	2.20	7.11	12.41
Soda,		11.15	
Chlorine of sodium,	0.04	0.16	0.36
Sulphuric acid,	4.19	1.51	12.12
Lime,	42.17	22.26	14.77
Magnesia,	2.16	6.40	8.00
Phosphate peroxide of iron,	0.45	0.32	2.47
Phosphate of lime,	9.79	26.19	10.44
Phosphate of magnesia, ...	0.51	1.34	3.15
Silica,	4.15	1.35	6.42
Coal,			4.48

In the foregoing analysis the carbonic acid was undetermined. It appears from the analysis that sulphates, gypsum probably, will have good effects upon the peach tree. The leaves in another analysis made in July, gave:

	PEACH LEAVES.
Potash,	14.28
Soda,	21.22
Lime,	16.22
Magnesia,	5.90
Phosphate,	11.60
Sulphuric acid,	4.42
Chlorine,	5.12
Carbonic acid,	14.30

The pits of a peach are rich in lime, phosphate of lime and silica. Lime must hold an important place as a fertilizer for the peach tree, provided we attempt to fulfil the indications furnished by the composition of leaves, wood and bark. The alkalies, potash and soda, are also to be supplied. Ashes, however, will supply all its wants.

§ 123. Composition of the leaves of the pear and apple tree at the time when the flowers had just fallen:

	APPLE TREE LEAVES.	PEAR TREE LEAVES.
Potash,	27.17	18.95
Soda,	11.83	15.19
Lime,	3.38	4.71
Magnesia,	2.74	4.50
Chlorine,	0.79	undetermined.
Phosphates,	26.60	25.05

Sulphuric acid,	10.12	undetermined.
Silica,	4.65	1.75
Carbonic acid, ....	.55	11.56

Both the apple and pear leaves are rich in alkalies as well as phosphates. Whether an analysis in September would furnish similar results is doubtful, as it is believed that there may be a transference of these bodies to the maturing fruit.

§ 124. Analysis of the ash of the leaves of the Catawba grape, gathered June 2d:

Potash,	13.39
Soda,	9.69
Lime,	4.39
Magnesia,	1.74
Phosphates,	32.95
Sulphuric acid,	2.09
Silica,	29.65
Chlorine,	0.74
Carbonic acid,	3.05
Ash of the wood,	0.98

At this period of the year the leaf is rich in phosphates and alkalies. It is well known that bones and alkalies are among the best fertilizers for the vine.

§ 125. The ash of wood, it is shown, differs in the proportions of organic matters. They differ also, in quantity of carbon or charcoal the wood furnishes. Thus, beech wood gives 17.16 per cent. of charcoal. Deducting its ash, it leaves 16.94 as pure charcoal.

The iron wood gives 16.21. Deducting ash, it leaves 15.91. The broad leaved laurel gives only 7.30; and deducting ash, 6.60. The wood is very compact.

The chestnut gives 9.75; ash 9.27.

The white elm gives 15.84 per cent of coal, minus ash; leaves 15.04.

The black birch gives 16.01 charcoal, minus ash, equals 15.96.

The pear tree has 9.79 per cent. of coal, and the apple 15.90; abstracting the ash of the latter, it is reduced to 15.70.

From the foregoing, it appears that the quantity of carbon or coal which the hard woods furnish, rarely exceeds 17 per cent., and this is reduced by extracting the ash.

CHAPTER XV.

Nitrogenous fertilizers most suitable for the cereals. Correlation of means and ends which meet in fertilizers. The final end of nitrogenous bodies. The power to store up or consume fertilizers modified by age, exercise and temperature. Error in cattle husbandry. Crops containing the largest amount of nutriment. Weights of crops, etc. Indian corn and turnips. Sweet potatoes. The produce of an acre of cabbage, etc. Cultivation of fruit trees—trimming and protection.

§ 126. As those substances are the most suitable for fertilizers, especially for the cereals, which contain the most nitrogen, so, those containing this element are the most suitable food for animals; and as none of the cereals can be grown without this element, so animals cannot be sustained unless it forms a part of their food. There is, therefore, a correlation of means and ends existing in the established order of things between what plants and animals require for sustenance. In the first case, it would seem that the nitrogenous compounds are secondary necessities, while in the latter they are primary, or have immediate reference to the characteristics of the class of beings by whom they are required. They are more essentially the force creating elements, and are designed to be expended for this purpose, and never to accumulate beyond the creation of the parts which are the seat of the force, while in the vegetable kingdom they accumulate and are not consumed in the performance of any of its functions. Gluten, a nitrogenous element, and starch, a heat producing element, accumulate in the grain. There they remain until on being received into the animal structure; the latter is expended in developing heat, the former in motion or exercise of the muscular organs.

§ 127. The final end, then, of furnishing nitrogenous bodies to growing vegetables, is to supply necessities which the nature and construction of animals demand; and herein is a broad distinction between the two kingdoms—accumulation in one, waste in the other, or a consumption of its own organs in animals, requiring therefore constant renewal to supply the place of the wasted tissues which have been expended in the development of force.

In the animal economy the heat producing bodies, *starch, gum, oil and sugar*, cannot be substituted for the flesh and force produc-

ing bodies, gluten, albumen and fibrin or casein; their functions being totally different. A dog cannot live on pure starch or sugar; neither could his life be sustained on pure fibrin. There is always a mixture of these bodies in all kinds of food as prepared by the organic bodies.

Wheat, Indian corn, rye, etc., have been shown to consist of a number of elements belonging to each of the class whose functions in the animal economy have been stated. Any of the cereals will sustain life, as they furnish both heat and flesh. Rice contains less of the flesh producing elements than wheat. Indian corn by itself is probably the best life sustaining body of this class.

§ 128. The ability or power of the animal machine to consume and store up elements is modified by exercise and age. The growing animal only accumulates as it is necessary; it is a law that the young should attain the size of the species; so in passing from the embryo to the adult state, consumption falls short of accumulation, when the adult state is attained accumulation is no longer necessary, and the amount of food taken has to be adjusted to the preservation of the balance between the food eaten and the forces which consume it. Exercise increases consumption, a fact established by numerous experiments made with healthy animals. This is an important consideration when applied to the fattening of animals. When they are allowed to run at large and exercise at will, or even subjected to such an amount of exercise as may be required to feed, the accumulation of fat is slower, and the quantity of food is less, which is necessary to reach that state of obesity required for the stall; a larger amount of food is necessarily consumed than is essential to it when the animal is still and performs no more exercise than health demands.

In illustration of the foregoing statement, it has been determined by experiment that where 20 sheep were allowed to run at large in an open field, they consumed 19 lbs. of turnips each day for 3 successive winter months; they gained during the time of trial 512 pounds. Twenty other sheep kept for the same time in a shed, and upon an average consumed 15 pounds of turnips per day, and increased in weight 790 pounds. In addition to the turnips both flocks were fed half a pound of linseed cake and half a pint of barley, but from inclination the enclosed flock consumed one-third less linseed cake than the out door flock. The increase in the confined flock was greater, and also the consumption of food less.

Protection from cold weather is another way of increasing weight by the use of less food. Those elements which are burnt in the system for the purpose of developing heat, must be provided in larger quantities and proportionate to the severity of the cold to which they are exposed. The starch, oil, sugar, etc., is consumed for the generation of heat, which would be deposited in fat if the medium in which they are placed were warmed or was protected from extreme severities.

The natural adjustment, then, of food to the wants of the system is influenced by age, exercise and temperature. The two latter may be controlled by means both simple and cheap, so that both food is saved and accumulations of fat deposited.

§ 129. The great error in this State in cattle husbandry is, the practice of compelling animals to shirk for themselves both winter and summer. So effectually do they consume all they eat in winter to keep themselves warm, that when spring comes they are more *than spring poor*, and two months is required to get them up to a living condition; and it is rare that a fat animal is found or made during summer and autumn.

There is, then, no doubt that shelter and food is required in North-Carolina as well as in New York, though the climate is much more favorable here for every purpose than in the north. The natural food which is mostly the produce of old fields and the wood and swamp ranges, is far less nutritious than the cultivated vegetables; more exercise is required to get it, and hence a greater amount of expenditure of force is necessary. This, coupled with the fact of a less nutritious food and exposure, accounts for the small size of the stock of the Southern States.

§ 130. It is an interesting enquiry, what crop or production contains in itself, the largest amount of nutriment or life-sustaining elements? In a question of this kind, it should be understood that it is not simply albumen or gluten, the flesh producing bodies, which are involved in the question, or the quantity of heat producing bodies as starch, sugar and gum; for neither class of bodies is in reality life sustaining by itself, but it relates to, or means to inquire, what crop per acre contains that combination of the heat and flesh producing bodies in the greatest quantity? A good old Malthusian would regard this as a question of the deepest import, and would call to his aid the power of arithmetic and of the statistics of crops to solve the question.

§ 131. To obtain a close approximate solution of this question, it is necessary to state the several weights of the crops which an acre yields under good culture. An acre should yield, for example; 25 bushels of wheat, though large territories may not yield more than 15 bushels; but an acre which will yield 25 bushels of wheat will yield 60 bushels of corn—it is always competent to do this; but the reverse of this is not true, for swamp lands will readily produce the Indian corn, but not more than half the amount of wheat and of a poor quality.

If Indian corn is compared with the turnip, which is regarded in England as furnishing the greatest amount of life preserving elements, it will appear that in this respect it exceeds our favorite crop. It is assumed that a crop of turnips yield per acre 67,000 pounds, but only one-ninth of this is nutriment, the rest is water; there is, therefore, out of the 67,000 pounds only 8,444 of dry matter. The heat producing elements only equal 6,220 pounds, and the flesh producing bodies amount to 1,000 pounds. The grain of Indian corn contains in an acre 2,780 pounds of starch, oil, &c., which belong to the heat producing bodies, while the flesh producing amount to 840 pounds. If the grain only is taken into the account, turnips rank higher than corn in their life sustaining power. But it may thus be that though turnips outweigh Indian corn, it is not clear that in actual service this crop could by itself be employed for the human family; it answers a good purpose as one of our dishes, and gives a relish to a turkey or roast beef; no one would like the process of being fattened exclusively upon turnips. But Indian corn being susceptible of all kinds of treatment by the cook, each one of which is generally relished, it is highly probable that it should be placed highest in the scale as a life sustaining body.

§ 132. Of the root crops, though turnips in England are preferred to all others for fattening cattle, yet they must rank far below the sweet potatoe. The dry matter in the sweet potatoe amounts to 30 per cent. It contains 19 per cent. of starch, 5 per cent. of sugar, and nearly 1 per cent. of dextrine or gum. Its heat producing bodies in the aggregate amount to 25 per cent. at least. It contains nearly 7 per cent. of flesh forming bodies. A crop of sweet potatoes will weigh per acre about 30,000 pounds. The quantity of starch, sugar, &c., will amount to 7,625 pounds, and

the weight of the flesh producing elements amount to 2,100 pounds. The life sustaining elements, therefore, in the sweet potatoes exceed those of the turnip, and would be preferred by far to them; and if the human family was reduced to the alternative of subsisting upon a single product, the sweet potatoe would do, because, like Indian corn, it may be cooked in various modes and made to suit the palate, which is by no means to be lost sight of. But the turnip has too much water, is too insipid for daily use by itself, and could not be employed alone as a life sustaining substance, notwithstanding its rank. It takes rank because of the immense weight of a crop upon an acre. Taken pound for pound and it ranks low in the scale of nutrients. A person would have to consume 3 pounds of turnips to obtain the nutrient matter of one pound of the sweet potatoe, if our estimate is founded upon the quantity of dry matter which they respectively contain. In the Indian corn there is about 14 per cent. water; by the most thorough drying it amounts to 16. The remainder is important as a nutrient, taking the word in its broadest signification.

We are aware that Johnson's doctrine is somewhat different. He maintains in his scale of heat producing elements that the turnip will support eight times as many men upon the same acre as wheat. On the other hand, when they are estimated for flesh forming qualities, turnips will support four times as many men as wheat, Indian corn, or barley.

Cabbage, however, it is admitted, ranks higher than turnips in its flesh forming elements. The Irish and the negro population seem to understand this; the former particularly, purchase in market a cabbage, if it is to be found.

§ 133. The produce of an acre of cabbage amounts to 24.2 tons if their heads average 10 pounds each. Of this quantity 20.2 tons is water and 4 is dry cabbage, of which a ton will contain 324 pounds of nitrogenous matter. A ton contains 18 pounds of inorganic matter, but if the substance is perfectly dry, it contains 153.9 pounds. The problem to be solved, however, is not the power of the different kinds of substances to sustain life by their actual amounts of heat or flesh producing elements which they contain. It does not seem to be intended that either man or beast should subsist upon one kind of food. The appetite is never satisfied with one or two things even,—it seeks variety; and when variety is at-

tainable, the strength for labor and the enjoyment of health attains its maximum power.

Turnips and cabbage are important articles in the list of nutriment; and although they may contain more nitrogenous matter than wheat or corn, yet few persons would make them their exclusive meat and drink, unless driven by necessity so to do; and if necessity compelled men to take them, the power to work and endure fatigue would be diminished, while Indian corn, wheat, or even sweet potatoes, though they contain less nitrogenous matter, would supply the wants of the system much better.

§ 134. It is maintained, and the fact should be noticed in this connexion, that root crops, particularly the turnip, are to be specially recommended for cultivation as they impoverish the land less. Let us look, however, at the facts. A good turnip crop weighs to the acre 67,000 pounds, and its inorganic matter or salts amount to 450 pounds to the acre, while wheat has only about 60 pounds in the 25 bushels. Cabbage takes away about 600 according to Johnson, but this is rather too little for dry cabbage; it amounts to 615.34 pounds. Green cabbage contains only 18 pounds to the ton. When we consider, then, the great weight of a good crop of turnips or cabbage, it will be admitted, we believe, that they are really more exhausting than the cereals. It makes no difference in the final results if it is proved that the root crop derive a large share of their nutriment from them; they must obtain inorganic matter from the soil in due proportion, and experiment proves that they remove more from the soil than other crops. This is not stated with a view to discourage the raising of roots. They have their place in feeding animals in the winter and spring when the green grasses cannot be had. But they should not be selected for cultivation on the erroneous doctrine that they do not impoverish the soil, or to less amount than the cereals and many other crops.

§ 135. Our remarks thus far have related to the cereals and those crops which are designed for the sustenance of man, or rather the character of the elements which he constantly employs.

We have another class of nutrients in fruits, which are of vast importance. Their cultivation is every where, we may say, receiving special attention, but many work on the old doctrine that a fruit tree or vine will provide for itself, if it is once fairly planted and watered a few times. It lives and may be it flourishes a few years,

but in process of time it ceases to grow, and its fruit fails in quantity and quality. In such a result the planter is very apt to say that the climate is unsuitable for its growth.

But let us briefly inculcate the true doctrine relative to trees. They require fertilizers as well as the cereals, and most of the fruits are injured by heavy grass culture, and especially by corn. The reason is they are robbed of food. Roots extend much farther than many suppose; hence the deep plowing at a distance from the trunk breaks up the rootlets and cuts off the channels through which nutriment ordinarily flows. Thrifty and profitable trees are made in this way only, that of supplying that variety of nutriment which any farmer knows his wheat or corn requires. The mode which should be followed in applying it, is to broadcast it over the surface, and which should extend beyond the shade of the branches. Very few rootlets for the support of the tree are thrown out, ordinarily, near the trunk. It is of little use again to trench around the tree and deposit in the cut manure—it is far better to give the whole surface of an orchard dressings of composted manure. Such a course favors the development of rootlets, and the nutrient matter is carried down to them in that dilute condition which their spongioles require; and lastly, trees require clean culture, the removal of all weeds beneath, and suckers which sprout from the base of the trunk.

§ 136. Many trim their trees outrageously by cutting the lowest large branches; the consequence is the production of a high, slim-headed tree of little value. The growth of the apple tree is upward and narrow, with only a slight tendency to spread or expand laterally. This mode of trimming the tree increases the upward growth, and hence, a very imperfect head is formed by the lateral extension of the side branches. Trees thus mutilated always remain *cripples*, if the word can be applied to trees. Even peach trees in North-Carolina are deprived of their best bearing branches. In addition to the injury sustained directly as fruit-bearing trees, their trunks are also exposed to the heat of the sun, which blasts the south or south-western sides, in consequence of being deprived in part, at least, of the shading which they require from the branches.

In regard to vines, we believe the European mode of close trimming not well adapted to the cultivation of our native grapes. It

is unnatural, and not really required by our climate. It is true, the Catawba, under the knife and shears of foreign culturists, have survived thus far their mutilations; but this fact rather proves *their life tenacity* and natural recuperative powers under injury, than the utility of the practice. What the human system may endure under physic is one thing; what it requires, and is necessary for perfect health and developement, is another.

In our southern climate, protection from a burning sun on the side exposed from noon till five, is one of the most important points to be attended to, and probably it is equally necessary in the growth of young orchards and vineries to protect the roots during the heat and drouth of summer by *mulching*. The object is to preserve the water of the soil, or prevent its excessive evaporation by organic matters, which are the most retentive of moisture of all bodies which can be employed for this purpose.

NORTH-CAROLINA GEOLOGICAL SURVEY,

PART II.

A G R I C U L T U R E .

CONTAINING DESCRIPTIONS, WITH MANY
ANALYSES, OF THE SOILS, OF THE
SWAMP LANDS.

BY

EBENEZER EMMONS,

STATE GEOLOGIST.

RALEIGH:

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DATA SUMMARY

[illegible]

P R E F A C E .

THE Swamp lands of North Carolina seemed to require a special examination in consequence of their variable characters and their great extent of surface. Differing in all respects from the uplands, but possessing among themselves certain characters in common, and at the same time as bodies of land other characters, which are not common, we have entertained the opinion that they richly deserved a careful examination, and have been encouraged to undertake it in the hope that it would result in the discovery of many important facts. Such a result has been hoped for by the fact that other State surveys, as well as those which have been undertaken by private enterprise, have left this field untouched.

Viewing the subject in its most general points, before the work was undertaken, it seemed that the most important questions requiring solution were those which related to the condition and state of the elements which compose these soils, their relative and absolute quantities, and their prospective powers of endurance when brought into cultivation; the latter of which would be determined, or at least indicated, by the per centages which analyses would give. These are some of the views which have governed us in the choice of measures we adopted in executing the task, and which have also incited us to the undertaking. As we had already determined from several analyses that there were varieties of soil included under the general term *swamp lands*, though they have the same aspect and appear much alike, and yet were found to be unlike the best lands under this class; so we felt that it was important to be able to point out those particulars in which they differed. This is not at all difficult when subjected to laboratory tests, but it would be still more useful to point out some method which could be executed by the planter, and upon which he could rely, at least so far as to distinguish thereby the poor soils from the rich.

The method proposed is simply a mechanical separation of parts by means of water, and by which the coarse sands may be obtained separately from the fine, the latter of which are really the important inorganic parts, and which give in analysis the lime, iron, alumina, phosphates, magnesia, etc. These complex elements, which furnish these important nutritive or available elements differ in different localities and in different parts of the same tracts, facts which are explained in the text. In some they are reduced to 2.50, or 3 to 4 per cent., when in other parts perhaps of the same tract they exist in proportions varying from 10 to 50 per cent.

By a mechanical separation in the mode we have described, a planter may determine these important facts for himself with sufficient accuracy to guide him in his purposes, for it is an established principle, that when the inorganic matter does not exceed 3, 4, or 5 per cent., the land will not produce well. If, however, this small per centage exists only in a top layer, and at a depth of 18 inches or so, there is a stratum charged with a larger per centage, say 10 to 15 per cent. of inorganic matter in which the fine soil exists, the land may be cultivated successfully; if, however, a stratum of this kind is 5 or 6 feet below, or we have a mass of this thickness composed almost exclusively of vegetable matter, the plant will be unable to send its roots thus far, for it will perish too soon to secure a foothold on life, just as it would in a bed of marl, or a heap of stable refuse.

The Carteret county open prairie has been re-examined, and we find a more favorable composition of its soil than at a previous visit. Drainage of a tract has effected a shrinkage of the vegetable matter so much that a stratum of soil may be reached by the roots of crops. The tract, in its poorest constitution, is by no means to be ranked with a first class swamp soil. I have stated that there is a belt of excellent land surrounding the open prairie. But though the open prairie is not well adapted to the growth of the cereals, yet for Irish potatoes it is admirably constituted, and it is not improbable but that an enterprising man would make money by their cultivation. But I have stated the principal facts in their proper places, and need only refer to them in this place:

The labor required in the analysis of so many specimens has been exceedingly great. The work has been in hand more than two years. My assistants have been employed with me in the work

when in town and when out door work was impossible or could not be prosecuted to advantage. We have no doubt that much more should be undertaken, the results of which would be advantageous to the State, at least indirectly. It is highly important that lands so fertile should be brought into cultivation, and we have no doubt that large tracts which are classified under the term, *swamp lands*, are to become the best in the State for the growth of cotton. The great want which is felt is the construction of roads by which these lands may be reached and brought into market. We have no hesitation in saying that the two millions of acres of swamp lands are worth four millions of upland. In a rough estimate of this kind, we take *time and expense* of cultivation into the account—the time these lands endure without the use of expensive fertilizers, and the ease and the slight wear and tear of the instruments used in cultivation, when compared in the same list of expenses required in the cultivation of the uplands of the middle counties.

However this may be, our aim has been to place the merits of these lands in their true light; not to exaggerate or depreciate. If this aim has been secured we shall be satisfied with the results.

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SURVEY OF NORTH-CAROLINA.

PART II.

AGRICULTURE.

MAY, 1860.

E. EMMONS.

CHAPTER I.

The compensations which take place in nature and by which a balance of forces is preserved. Considerations relating to water. Water surfaces. Evaporation regulated by saline matters in the ocean. Carbon and carbonic acid. Insolubility of vegetable matter a conservative condition. Average fall of rain.

§ 1. Rational farming rests on compensations, and has to be conducted in accordance with the known laws of nature. If, in any part of space the balance of the forces is about to be lost, there will immediately set in counteracting forces to restore the balance which is thus endangered. The machinery of nature is so constructed, or under the government of such forces, that a balance is preserved among them. Heat rarefies the air, and it rises in space, but its place is immediately supplied from the surrounding cooler atmosphere. The great body of it may be moved over extensive areas, and when it has been subjected to excessive heat, the balance must be restored by winds and forces acting with a violence proportioned to the causes of disturbance. The evaporation of water from the soil is in part, and for a time, restored from the reservoir below. When, however, solid matters are removed from the soil by cultivation, the balance can be restored only by the hand of man. Even water has to be provided in certain countries by irrigation. But in the general operations of the natural forces, ample provision is made for supplying water, ammonia and carbonic acid to all parts of the earth's surface. If no provisions existed in the

machinery of nature to effect a general distribution of these important elements, the earth's surface would be a barren waste. Irrigation can only supply water under favorable circumstances. The great reservoirs of water for watering the earth are the oceans. Let us see how the machinery works when it is furnishing the supplies which vegetation every where requires. In the first place, it is necessary to know that the area which is to be watered must be rightly proportioned to that from which the supply is to come, and this supply is derived from the water surfaces provided for the purpose. Now, the Atlantic ocean has an area of twenty-five millions of square miles, and the Pacific of seventy millions. These are the two great water surfaces upon which an earth's surface of thirty-five millions of square miles is dependant for a constant supply of this element. Now, it is a necessary part of the arrangement, that water should pass from the state of water to a light vapor, at all temperatures. Water has this property, though we connect its vaporous state with its boiling condition, when its temperature is raised to 212° of Fah. But at this temperature we find that the heat it receives is just balanced by its apparent loss or by latent heat in the vapor as it escapes. While heating up to 212° its accession of heat is greater than the loss locked up in vapor, and hence, continues to accumulate, or to grow hotter, till it reaches this point. If vapor was not formed till water boiled, or indeed, if not formed at all temperatures, the earth would be uninhabitable.

Water then exposed to the atmosphere at all temperatures gets sufficient heat to change it into vapor. It is water still, but its particles are so widely separated by heat or expanded that if seen, it is a *mist*, a *cloud*, or *may be steam*. Its expansion lifts it above the water surface, but this is not all; the heat which has thus generated vapor, creates also currents, moving air, or wind; and wind is the transporting agent by which vapor is borne landward. It sweeps over vast areas, reaches the mountain ranges, and upon every object, tree, stone or land, which is cooler than the vapor itself, it deposits a part of its burthen. This is especially the case as it sweeps up the mountain side, if it is tall and reaches the region of frost, it is entirely disburthened of its load. It is here, however, where streams and rivers are formed and from whence they flow seaward, carrying back to the parent bosom every atom which

the sea had loaned. Should but a few atoms be lost in the outward or homeward journeys, the sea would fail to be kept full, and in process of time it would be dried up. Every atom is therefore sent back, and thereby the balance of nature is preserved. Water endowed as it is, must circulate and supply the earth, and its people with itself. A counteracting law would be required to arrest its service. Our safety, however, for a supply rests mainly on the ease with which the loaded winds discharge their cargoes. If they were more niggardly, and held on to their possession with a miserly grasp, the poor plains and rolling hills would be swindled out of their dues; and none but the snow clad mountain could extract the liquid treasure.

Nature then has provided a machinery for the distribution of water which works perfectly. The farmer may sit in his parlor and see its operations. He needs no watering cart to supply his crops like those used to lay the dust of the streets of cities. Such would be too expensive and cumbersome and would utterly fail. Compensation is the law. If the mountains, hills, and plains are irrigated by the forces of nature, ample provision is made for the return of the element to its parent bosom to be re-used and so work on as long as seed time and harvests shall continue. Now water how many times soever it takes its round of circulation never wears out, and it has been found, that a given area of land gets punctually its annual share; and those countries which are deprived of rains or water in its usual form, ever remain in this condition. This stability is due to the uniformities in the operation of forces. The winds, unstable proverbially, are still under the government of law, and hence, as carriers of rain, and distributors of the elements essential to the growth of plants, perform their offices so punctually and regularly that the kingdoms of nature rarely suffer from their failure to perform their office. But it seems to us at the first thought, that as three-fourths of the world has to be laid under water so that the other fourth may be supplied with this element that nature has been too lavish in its supply of evaporating surfaces. We are however, forced to admit the fact after we have found that it is rare that it is any where in excess. It is true that a few limited patches of land in India, where according to observations not less than 600 inches of rain fall during the year, a quantity which if furnished at one time would cover the country with a

depth of 50 feet. Here there appears to be a great excess of this element. As an offset however, to such excessive installments of rain, we have several rainless districts, as Peru, Chili and the Sahara of Africa, and hence it is probable that the average quantity of rain for the whole acreage of land, would scarcely exceed 50 inches; and hence, in the general operations of nature, there is only a sufficient water surface to supply the rains which are necessary to the vegetable and animal kingdoms.

The annual fall of rain at Chapel Hill is 43.96 inches. At Gaston 40.83 inches, and at Murfreesborough 32.54 inches. There is no excess of rain it would seem from the few observations to which we can gain access in the Eastern counties.

We have said that all the water which the Oceans loaned from their exchequers is returned in due time, not, it is true, in the same individual particles, for the Atlantic furnishes water to the Pacific, and there is no doubt a mutual interchange, but each gets its quota and thereby keeps its coffers filled.

But rivers, though they return all the water required, they do not return it in the pure, unsophisticated state it was when it set out on its journey borne by winds to the mountains. On its return it is burthened with salts of various kinds. It robs the soil every where of its matter which we call fertilizing. Is it a trespass upon the plantation through which the rivulet flows, a robbery of which the farmer has a right to complain? In general, it is not. In a few particulars it may be. We think the Roanoke should cease plundering the upper country, but in general, we may say, it is a necessary tithe to the parent waters. It is necessary to enable these great bodies of waters to fulfil their functions to earth and man, to the kingdoms of nature.

According to MAURY, the Philosopher of the Sea, these saline matters serve to keep the sea in motion; they bring particles at the top losing their proportion of fresh water, become more saline and heavier, and sink to be replaced by particles moving upwards. But when the evaporating forces act upon large surfaces under a vertical sun, the excess of fresh water removed is so great that a dimple in the surface of the sea is formed whereby the outer boundaries rush in to fill up the excavation. But saline matter in the sea retards evaporation; it becomes a check upon Eolus or any wind which would perhaps take too much at a time, and thereby

unnecessarily drench a part of the earth. Saline matter, therefore, checks evaporation, and as fresh water floats upon the surface and may be evaporates rapidly for a time, the process will be interrupted when a more saline layer is reached; moderation is thereby secured.

§ 2. But it may be inquired, what consequences are likely to follow from a constant access of saline matter in the ocean? Will it become surcharged by evaporation, and will it become too saline for terrestrial vegetation? Such would be the case were it not that the forces of nature tend here as elsewhere to balance each other. The sea is like a great peopled city. There are builders there who want matter for their habitations. There is the coral insect who builds reefs extending for a thousand miles in a continuous line; there are oysters, clams, and myriads of shell fish as they are called, who use vast quantities of lime and other materials. We have seen that the great depths of the sea are sanded with minute shells of foraminifera. All these builders conspire to keep the sea well balanced and cleared of excess of saline matter, and there will be no excess, because it is solidified by the organisms prepared for the purpose; and such has been the operations of life, in all past time; the older rocks are charged with marine organisms, and the newer are equally so, and it is in this way the planter is provided with marl and other fertilizers, deposited where the sea once stood. He now reaps the benefits of the saline matter which was robbed from the land millions of years ago. It is now returned back for his use in a better form and state. But the salt of the sea would form a huge pile if gathered into one heap. Shafhaul has computed, that the mineral matter suspended in the ocean, is equal to twice the bulk of the Himalayas. It is even said that there is common salt enough in the ocean, to cover an area of seven millions of square miles to the depth of one mile. We have reason to believe this immense amount of saline matter has been taken from the land since rivers have flowed seaward, though it is not fully settled, neither can it be; whether the ocean was created brackish, or was originally fresh water like our rivers, the *operations* of nature have not fully declared either in the affirmative or negative.

§ 3. The swamp lands of North-Carolina and of the Atlantic coast, contain a vast amount of carbon. The vegetable matter is

often more than 10 feet deep; and sometimes it is not easily sounded by the longest poles we can use. The quantity of organic matter, mostly carbon in some form, varies from one-half to ninety-five hundredths of the dry mass.

Whence has this vast quantity of carbon been derived? Now the answer to this question does not appear to be difficult. In the first place all of it was once alive, and it all consists of the remains of vegetables whose constituent element is carbon. Now the foundation of this carbonaceous body generally rests on a pure sand, or a mixture of sand and clay; in a great measure is entirely destitute of carbon or vegetable matter, and hence we may assume that the original soil did not contain this element and could not supply it. We are, therefore, obliged to look for a supply to the atmosphere as has already been indicated in a former treatise. It may be interesting to see the computations which have been made with respect to the quantity of carbon in the atmosphere in combination with oxygen, forming carbonic acid. Thus the whole weight of the atmosphere being known, it has been determined with great accuracy that its carbonic acid forms one thousandth of this weight, and as carbonic acid contains twenty-seven per cent. of carbon, the atmosphere will contain three thousand and eighty-five billion pounds of carbon. This quantity, it is maintained, exceeds all that is locked up in the forests, and in the condition of mineral coal in the earth's strata. From these facts we may be satisfied that the air can furnish carbon to an unlimited amount. It might appear that the withdrawal of this vast quantity of carbon from the atmosphere would materially affect its composition. Of this we cannot be assured. The withdrawal is a fact, but the sources of supplies are adequate to effect a replacement of the abstracted carbon. Thus in volcanic action vast quantities of carbonic acid pass into and mingle with the atmosphere. What is withdrawn by the operation of one class of forces is replaced by another, so that it will be found, that the true balance is preserved, that which organized beings, by their constitution require.

In the coal period vast quantities of carbon were withdrawn also from the atmosphere, and solidified in the anthracites and bituminous coals; and hence it has been said that this abstraction of carbon rendered the atmosphere better and purer than it had been in former periods. The carbonic acid in the concurrent changes

of the day, gave up its oxygen, which, being added to the atmospheric mass, improved it to the amount thus added.

Whether the constitution of the atmosphere has changed materially since animals and plants were created, cannot be settled by calculations of the foregoing kind. We must resort to the determination by facts of a different nature—those which relate to the wants and necessities of organic bodies. If our observations on animals and plants are extended to the coal period, we cannot find that they differed in their capacities to resist the poisonous effects of excessive doses of carbonic acid better than those of the present time. They appear to have been fitted to precisely similar conditions of the surrounding elements, and to have breathed an atmosphere like our own, and to have inhabited a medium identical with the waters now upon the earth's surface. In fine, it is not proved satisfactorily that the deviations in the composition of the controlling elements would injuriously affect the living organisms of the present period. So that to all intents and purposes the atmosphere was composed of elements existing in the ratios that they now exist. It is possible, however, that compensating forces were more active in early periods than now. If carbonic acid was removed more rapidly from the atmosphere in the coal period, it may well be maintained that volcanic agencies may have liberated more carbonic acid from the interior of the earth than now, and hence, a balance among the forces would be preserved.

§ 4. The vast body of carbon locked up in the swamp lands of North-Carolina must have been in solution, otherwise it could not have been received into the tissues of the plants. As it now exists it can scarcely be regarded as a soluble substance. If its solubility had been preserved it would have disappeared and found its way to the ocean. Insolubility is a preservative force, intended to protect important bodies from waste. The property, however, is excessively strong; as humic acid resists water alone with considerable force, requiring 2,500 times its weight to dissolve it. Both heat and frosts too affect its solubility; both enables it to resist solution. In these facts we find a preservative power by which vegetable fertilizers remain a long time unchanged.

§ 5. While the carbonaceous bodies are soluble with difficulty in water alone, we find that alkalies and particularly ammonia effect their solution, and it seems that they have a strong affinity for this

substance, absorbing it readily wherever it is in their reach. As ammonia is present in the atmosphere, and as rain contains it in small quantities and being carried down into the midst of the peat, it dissolves or combines with portions of it, and forms thereby food for the nourishment of plants. While then, water in which peat is constantly immersed scarcely dissolves it, ammonia comes in aid of its feeble solvent powers, and thereby prepares a nutriment for the growing crop; but the great store of matter remains, and is only prepared in divided doses. The conservative force exerted in solution, is not probably all that is concerned in supply, it is not improbable that the vitality of the plant some way or other regulates and controls the reception of nutriment. We are not prepared to say how. It may be ultimately worked out by successive discoveries similar to those which took place in regard to the changes effected by the plant upon carbonic acid.

It would then be like the history of all great discoveries, effected at different times and by the sagacity of different persons. Thus, Bonnet, first observed the evolution of a gas from leaves immersed in water; Priestly, discovered that that gas was oxygen; Ingenhouse demonstrated the necessity of solar light for its disengagement, and finally, to complete the range of discovery, Leuwestein has the honor of showing that the gas oxygen, is derived from carbonic acid. It is thus that discoveries advance in a certain line, step by step towards an ultimate fact, or generalization, which is required in order to express the perfection of the advancing series. It is only at the termination of such demonstrative truths, that theory receives its finishing stroke. In agriculture, practice has no doubt advanced farther than theory. Indeed theory is so far in the back ground that it may be regarded as existing in expectation, rather than in fact. The advancement of agriculture then, cannot be ascribed strictly and in truth to theory; neither has it been so much under its guidance as many of the sciences. Many practical suggestions have sprung up from theoretical doctrines; still, the practice of agriculture is rarely governed by them. Indeed agricultural theories, belong to the, *a posteriori* class, or those which have grown out of experience. That the practice of agriculture has advanced far towards perfection without the aid of theory, is not surprising, when it is considered that its operations are very simple, and that results flow from them with great cer-

tainty. This fact has prevented that special consideration of phenomena, which would have come to pass in more complicated arrangements. Besides, the phenomena with which agriculturalists are most familiar, are enveloped in a kind of mystery; and hence, appear to be beyond their reach. They can however, bring out the phenomena of vegetation in its season; the grass and grain spring up when they sow the seed; they grow up under their eyes, though not in obedience to their will. They stand however, in the place of its proximate cause and they have learned by ample experience, that their growth may be promoted or retarded by certain agents; yet, the why and the wherefore they have not satisfactorily determined.

CHAPTER II.

The UTILITY resulting from the analysis of soils. Methods pursued.

§ 6. A change of opinion has undoubtedly taken place in the minds of farmers and chemists respecting the advantages of soil analyses. In the earliest days of agricultural chemistry expectations were no doubt too high; too much was expected. It would, however, be contrary to facts, to deny that agriculture has been advanced by the analysis of soils and the ash of plants. The knowledge of soils is certainly much more exact than it could have been had their composition been left to conjecture; and it is certain that farmers do proceed in the application of manures with better and more distinct ideas of what they are doing and what they want. They now know the reason why the expensive manures, potash and the phosphates, need be applied.

§ 7. It is no legitimate argument against analysis because it has not accomplished all the utility which may have been claimed when systematic agriculture was younger. If farmers and chemists will only look at results, or study the history of agriculture for the last fifty years, they will feel satisfied that its advancement has

been due in the main to chemistry, and in part to the direct results of the analysis of soils. Indeed, no real or rational progress could have been made until much had been done in this line of chemical research. The importance of minute proportions of the alkalies, alkaline earths and phosphates could never have been understood without these analyses. Experiments too, have grown out of chemical results of the highest importance. The use of organic matter has been established by experiments suggested by analysis. It has been proved that organic matter is equally important with inorganic, and moreover, must exist, or be furnished and exist in it in a certain condition. No soil is absolutely destitute of organic matter, but in the South its proportion is often too small. Planters in the Southern States now understand why marl is injurious in certain cases. They know how to prepare it for use to avoid disastrous results; and all this must be traced to the benefit of the analysis of soils. Show the planter a field which is deficient in organic matter, and his application of marl will be governed by this fact. He knows that if a large dressing is applied, his objects will be defeated. He will proceed and make a compost of organic matter and marl; and he knows that thus prepared, he may use marl freely on poor land.

Now, accident could not have put him in possession of this important practical precept. He would, and did find out, that heavy dressings of marl were injurious to crops for one or more years; but he would never have discovered that it was due to a deficiency of organic matter. This main fact was determined by analysis, and moreover, it led to the settlement of the question respecting the condition of the matter itself, and it is well established that it is necessary that it should be oxidized, and pass to the condition of an acid, in which state, it combines with the alkalies and earths, and forms soluble bodies. These organic salts become the food of the crop. The fact then, that organic matter is indispensable to a fertile soil, together with the reason why, has grown out of analysis. But this is only one result. It may be said generally, that all the most important experiments in the growth of crops have grown out of the analysis of soils. For example, it was found that the phosphates and alkalies formed only small fractions of all, even fertile soils, and it occurred as it naturally would to philosophical minds whether such small doses were really necessary to

the ripening and perfection of a crop. Experiments to settle this important and interesting question were set on foot to determine it, and they have resulted in showing clearly and satisfactorily that however little they may be, they are still essential to the perfection of seed. Now, what has grown out of analyses must be regarded as it respects utility, as a part and parcel of the original investigation, and analysis thus viewed cannot be regarded in other light than as having been eminently useful. It was necessary that it should precede and prepare the way for this experimental work, and we may probably assume that unless the preparatory steps had been taken, those important questions would not have been propounded.

The great objection which has been made to the utility of analysis is that chemistry is incompetent to detect the certain minute and essential elements of soils, without which the plant cannot perfect itself, may exist in the soil in sufficient quantities, and yet be beyond the reach of the chemist's skill to detect them.

Chemical analysis for example pretends not to find a less fraction than $\frac{1}{1000}$ of a grain; an acre of soil one foot deep will weigh 2,000,000 pounds; an ordinary wheat crop will take off 200 pounds of mineral matter, allowing one half to be phosphates and we have only one twenty thousandth part composed of that part or quantity; and hence, too small for the chemist to find. Four hundred pounds of guano, containing say one-fifth phosphates applied to an acre entirely destitute of phosphates, would, it is claimed make all the difference there is between a good crop and no crop at all; but this eighty pounds, distributed through (2,000,000) two million pounds of soil would be too trifling a quantity for the present state of chemical analysis to detect. Besides, it is farther said he does not need it, it being too expensive and the general deductions of the chemist are of more value to him than any particular analysis of his soil. Granted; but then, these very deductions are either the results of analysis, or of experiments which analyses have suggested and called for. There can be nothing truer, and hence to discard analysis on the grounds stated is unjust to Liebig, Johnson, Mulder and others. Then again it is said that a Boston chemist found a barren sand of New Hampshire, with the same composition as another specimen from the rich Sciota Valley. This we doubt; be that as it may, the subsequent paragraph shows very distinctly the prominent differ-

ences of the two examples of soil. The New Hampshire barren sand was extremely coarse, the Sciota Valley soil on the contrary extremely fine. No one denies the importance of texture in a soil and the chemist who should neglect to state the differences between two so much alike in the quantity of sand, would omit a very important piece of information. It would belong to a series of general deductions which the chemist has formed from either his chemical and mechanical analyses of soils.

Again, the statement that one-fifth of the four hundred pounds of guano, consisting of phosphates distributed through 2,000,000 pounds of soil, makes all the difference between a good crop and no crop at all, is an assumption. In the case of the application of guano, it is only fair to assume that the 400 pounds added is just so much addition to the fertilizing matter already in the soil, and in most cases we have never found an exception to this result, that phosphates may be detected in 1000 grains of any soil. We are unbelievers in the doctrine that 80 pounds of phosphates only in 2,000,000 pounds of soil would produce a crop of wheat or any other crop; that it will, however, or will not, requires to be tested by experiment.

§ 8. The correct analysis of a soil is by no means a short and easy task, as many have supposed, or seem to suppose, when they forward their packages to the laboratory, and seem to expect replies within twenty-four hours, at least.

That the reader may entertain more rational views of the work than is usually expressed by our correspondents, we give in part the remarks upon this subject, by Dr. C. T. Jackson, of Boston.*

"The analysis of soils is so difficult, and requires so much time, that the chemist is often discouraged, and if paid for by the planter, it would cost more than he could well afford. Hence, trustworthy analyses must be made at the public expense, under the direction of government. The manner in which the present analyses have been made, demands from twenty to twenty-five days, and no chemist can properly attend to more than one analysis at a time. I state this to correct erroneous impressions on the subject. In determining the ingredients of a soil, we have to work on a great

* Patent office report for 1858—pp. 291, 293.

number of its separate portions, sometimes employing 100 grains in the analysis, and at others 25, while to separate those ingredients which occur sparingly, we employ at least 1,000 grains for each determination. The results are subsequently reduced to percentage in the tabulated form. In the first place, the sample has to be dried at a moderate temperature in a current of dry, warm air, and then thoroughly mingled, so that the successive portions taken for analytic processes may be exactly alike.

To determine the amount of organic matter, 100 grains dried at 212° Fah. are burned in a platinum crucible, when the loss by combustion and volatilization is ascertained by decrease of weight. Then the soil is digested with chlorohydric acid, the matters soluble in the acid are ascertained by the usual method, and their proportions stated. Another analysis of 25 grains is next taken for analysis by entire solution, and this is decomposed by fusion with carbonate of soda in the manner employed in the analysis of insoluble silicious minerals, and a complete analysis made, all the ingredients being weighed excepting the alkalies, which are determined by difference, while their relative proportions are ascertained by the analysis of 100 grains of the soil by acids, and then their ratios are computed for that portion which had been analyzed by fusion with soda.

Again, separate portions of 100 grains each are employed for the determination of the proportions of carbonic and phosphoric acids, the first being ascertained by expelling, by means of a stronger mineral acid, in a proper apparatus. The phosphoric acid is thrown down from an acid solution in combination with peroxide of iron, lime and magnesia, all of which are precipitated by ammonia. The weight of these substances combined is first ascertained, when they are all re-dissolved and the oxide of iron is separated in a state of sulphide of iron, which is again converted into peroxide of iron by nitric acid, and re-precipitated, and again weighed, whereby the proportion of phosphates is ascertained. This is again checked by analysis of the sulphide of ammonia and solution of the phosphates.

Then for the determination of sulphuric acid, chlorine, nitric acid, ammonia and the organic acids, we operate on separate lots of soil, each weighing 1,000 grains. Sulphuric acid is precipitated by means of nitrate of barytes; chlorine by nitrate of silver; nitric

acid is tested in an aqueous solution of the soil, boiling it with chlorohydric acid and gold foil, to see if it dissolves any gold, and by evaporation of the aqueous solution to dryness, and by testing the deflagration of the dry residue which contains organic matters mixed sometimes with a minute proportion of nitrate of potash. There is no direct mode of determining the proportion of nitric acid in a soil. It occurs only in minute proportions.

The organic acids of the soil, crenic, apocrenic and humic acids are separated together from the insoluble humus by means of a saturated solution of carbonate of ammonia, and after filtration this solution on evaporation to dryness will give the weight of these acids, with some phosphates, which are always dissolved by the ammoniacal solution, namely, the phosphates of lime and magnesia.

On burning the organic acids these phosphates are obtained, and their weight deducted from the combined weight of the organic matters and phosphates. By deducting the weight of the soluble organic acids from the whole weight of the organic matters, we have that of the insoluble humus or carbonaceous matters. We also deduct from the soluble organic acids the weight of the ammonia and determine it by a separate process on another 1,000 grains of soil. The ammonia is ascertained by digesting distilled water, acidulated with pure hydrochloric acid with 1,000 grains of the soil; then on filtration, evaporation of the acid aqueous solution, and the addition of bi chloride of platinum solution, we obtain ammonia, as a soluble chloride of platinum and ammonia, by which it is easy to compute the proportion of ammonia in the organic matter of the soil from the weight of the double chloride."

We have pursued for the most part the foregoing detailed methods, the results of which are usually satisfactory. Probably the analysis of the soil of the swamp lands will be attended with more utility than those of the midland or mountain counties, for it determines with certainty the fact whether they are susceptible of cultivation or not, and also, it determines the cause of their worthlessness.

Furthermore, as it regards the utility of analysis, we believe that they have promoted the advancement of agriculture in an eminent degree, and the reason why agriculturists and certain chemists decry their utility is owing to their not effecting what enthusiasts

promised, or what was expected. Too high expectations when unfulfilled are very liable to produce a reactive feeling and to call out sentiments entirely of a depreciating character, or to lead persons to say that they are of no account. But until thorough analyses had been executed, a correct view of soils, either practical or theoretical, could never have been obtained. We now know for a certainty, some of the functions of a soil, and it is a great deal to know that the most important elements of growth exist only in minute quantities, and that they may be removed in the course of a few years' cultivation. This is a practical fact, and could not have been guessed out; it remained to be determined by the skill of the chemist and accurately conducted experiments.

CHAPTER III.

The swamp lands. Their mode of formation and geological age.

§ 9. It is maintained that soils are the debris of rocks which have been forming from the earliest periods of the earth's history. This is no doubt literally true; but the debris has been subjected to certain changes, particularly those of place. It has not lain by the side of the rock from which it was separated in but few instances, but its removal or change of place has been excessive in many instances, as in the western and northern States, while in the South that agency which is recognized there has not been in operation here. In this State, no currents of water have ever swept over the face of the earth, so as to remove the soil to a great distance from the rocks from which it was derived. In the course of time, that which belongs strictly to the present period, however, a partial removal to distant quarters has taken place. This removal was effected mostly by rivers acting locally upon banks of soil, which by little and little were transported to the Atlantic coast, or to inland bays, like the Albemarle and Pamlico of our coast.

Now, the soils during the act of removal, were subjected to the

assorting power of water, whereby the coarser parts were separated from the finer and distributed according to the comparative gravity; the finer particles being transported farther than the coarse, and probably in different directions, both laterally and more widely.

The present operations of water illustrate in part the nature of those by which removals formerly took place. We cannot but notice the turbid conditions of the Roanoke, the Nense and the Cape Fear, during a freshet. It is due to the soil which has been lost from their banks, and which is being transported seawards, but which must subside in part, before the waters reach their destination. In freshets, the low grounds are inundated with this muddy water, and it frequently happens that an inch or more of fine soil is deposited at certain places which are favorably situated, or in places where the waters are unagitated by the rapid currents. What is usually seen, however, is along the immediate banks of the rivers, and it is not unfrequently the case, that all the old vegetation, however rank, is buried, or concealed beneath the sediment. But in addition to this heavy deposit, there is still a finer one which is carried by the water into lateral marshes, and this water, though robbed of a part of its burthen, still retains the finest, which slowly settles among the moss, reeds, grasses, &c., which belong to this peculiar formation. These waters are slowly drawn off, and perhaps even remain for weeks, and are only disposed of by mid-summer, by evaporation, and during the time vegetation is active while it is receiving the fine sediments of the overflowing rivers. In conditions like the foregoing we probably find the best swamp soils formed, inasmuch as there is added to to the growing mosses fine sediments which become the basis of the best of soils, and which are intimately intermingled with an abundance of fertilizing matter in the condition of peat.

Such is the process by which the best swamp lands are made, while the poorer being situated where only the white assorted sand has access. When the sand and vegetation has reached a certain height, or has attained the level of ordinary freshets, vegetation still goes on, and moss, grass, and certain herbaceous plants and trees, still grow, until the surface upon which they stand is higher than the margins. The whole mass of vegetation which grew in former years is like a sponge, and it is at all times nearly

aturated with water. In this condition it receives no further addition of soil; it is a mere growth of water living vegetables which maintain their place by their constitutional adaptations. This vegetation is divisible into two parts, the dead and living; the former beneath, the latter above. This *status quo* is maintained solely by the low temperature of the swamp. All the vegetation below is as it were, water logged, and in process of time it simply blackens, as it is a water charring; and when it has become peat it undergoes no farther change. This is the exact condition of many swamps; above they consist of a mass of vegetation of the poorest plants, the mosses and coarse grasses; and for trees, some pines of a small size, and many bays or magnolias. Let such a swamp be drained and it subsides from a one to two feet; a change which is confined to the upper part. In early days, or when first forming, sand was received from a distance, or it may have been laid down upon an old sandy sea bottom. But it has generally happened that the lower parts of the vegetable mass is mixed with sand, showing that though the swamp was based upon a sea bottom; yet, being basin shaped, it continued for a time to receive materials from a distance. The age of these deposits is no doubt recent. They repose upon the eolian sands, and generally, so far as their bottoms have been exposed for examination, they belong to most recent coast deposits, and yet, it is probably true, that they extend far back beyond the settlement of the coast. Still, they are properly modern formations, and are entirely connected with the present state and arrangements of the present line of coasts, and the river systems coming in from the interior.

It is probably true, that as to agricultural value, it will prove that those which are the highest or have become higher than tide water by growth of vegetation, they are of less value while those which are so situated that they receive the overflowings of rivers until a late period, and hence are last formed, are the most valuable. Hyde county, for example, is only about 4 or 5 feet above storm tides. The Dover swamp in Craven county, we believe, is nearly 60 feet; the first is excellent land, and the latter worthless,—or comparatively so. In the same field, however, with these poor swamps we may often find fertile islands capable of bearing heavy crops of corn. The means by which such islands may be recognised will be stated farther on.

CHAPTER IV.

Geographical position of the swamp lands, and their extent in North-Carolina. Defective information in the public archives of the State. The Savannah lands, etc.

§ 10. The lands under consideration are confined to the eastern counties. They scarcely touch the long, narrow sounds which skirt the Atlantic. Large bodies extend from fifty to one hundred miles from the ocean, and occupy wide belts, not far from, and parallel with, the principal rivers. Their shape is, however, irregular, and it will be seen by the inspection of any correct map, that they must occupy ground considerably higher than the beds of the river which they skirt. They are reservoirs of water, and numerous streams issue from them on all sides which find their way to the river channels by exceedingly crooked routes or courses.

§ 11. The most northern swamp is a continuation of the great Dismal, lying partly in Virginia and partly in North-Carolina, and which occupies large tracts in Currituck and Pasquotank counties. Pasquotank river rises in this swamp, its head being really in Lake Drummond, in Virginia. Towns and numerous hamlets, however, are planted in the great Dismal Swamp. It is traversed by roads, and few in passing through this section of country would suspect they were in this swamp, famous the world over for its ominous name.

The largest territory of swamp lies in Washington, Tyrrell, Beaufort and Hyde counties. Its whole length is rather more than seventy-five miles from east to west, and at least forty-five in the widest part from north to south. It lies between Albemarle Sound, the lower Roanoke River, and Pamlico Sound, Pamlico and Tar Rivers. The most eastern parts of this great tract, however, should be regarded as *marsh land*, and subject to overflow during storm tides. Like all swamp lands, the middle is higher by a few feet than the margins. It terminates westward, near Washington, Beaufort county. This great body differs from other swamps by a more uniform continuity, and a more perfect level, and with fewer knowles, called *islands*. Hyde county, for example, is level as a house floor, and as even as a well constructed garden. It is but a

few feet above tide; too few to give depth for wells, and hence, water for cooking is supplied mainly from cisterns resting upon the ground. This swamp has four shallow lakes of considerable size. The largest is Matamuskeet, which is twenty miles long. Lying a few feet lower than the swamp are tracts of stiff clay soil, probably as good for wheat as any in the State, but these diverse kinds are never intermingled; the clay is a kind of outlier or border. The lands of this great swamp have become famous for the large crops of corn they produce. They are called the Hyde county or Matamuskeet lands.

Again, included between the forks of Pamlico and Neuse Rivers is another swamp thirty miles long, but in area, it is less than an eighth of the Matamuskeet Swamp and Pungo Swamp.

South of the Neuse, and lying in Carteret and Jones counties, there is another immense tract of swamp land, 80,000 acres of which is known as the open prairie of Carteret. In nearly a continued belt this swamp is 75 miles long from east to west, but its width is less than the Matamuskeet swamp. It is not by any means perfectly continuous. It admits the passage of roads, but it lies nearly upon one plane, and the slight inequalities scarcely serve to divide it into separate sections.

Dover swamp is an isolated tract some fifteen miles in length, and is crossed by the Atlantic Railroad.

Onslow and Jones counties contain a part of the great Carteret tract. This tract, at its western extremity, gives origin to the White Oak creek.

Holly Shelter swamp lies parallel with east Cape Fear river. It begins in Onslow county, but the greatest part lies in New Hancover county, east of the Wilmington and Weldon Railroad.

In Brunswick county lies the Green swamp. It is rather lower than those we have mentioned, but it is peculiar in having numerous islands; that is, rounded hillocks, but slightly elevated above the general surface of the swamp. These are inhabited by squatters, who live by basket-making, and by general plunder of those materials which can be turned into hominy, hoe-cake and a little bacon. On the border of this swamp there has been formed a beautiful lake with clear water, and known as Waccamaw lake, and from which flows the Waccamaw river, a boatable stream, though it is liable to be blocked up by trees and dead timber.

Livingston's creek rises in this swamp, and is boatable from the Cape Fear to the crossing of the Manchester Railroad, and up which the tide flows twelve miles, rising something like two feet at its mouth. Columbus county contains large bodies of swamp land, but not so continuous as the Green swamp of Brunswick.

The whole number of acres of swamp lands in the State is at least two millions, of which the State owns *one million five hundred thousand*. This, however, does not include the marsh lands bordering the sounds. There are also smaller tracts owned by individuals, of considerable value, in all the counties we have named. There is, however, a deficiency of statistics and records of surveys, and although the swamp lands are vastly important, the archives of the State furnish really no information of value. Private individuals who are personally interested in large tracts of those lands, have furnished all the reliable information we possess relative to them.

In contrast with the swamp lands, we may briefly notice the Savannah lands. These are beautiful, open and level spaces, covered now with broom grass. We have not been told what they produced in early times. The largest in the State lie on both sides of the Wilmington and Weldon Railroad, in the county of New Hanover, and not far above Wilmington. A traveler passing over the road in the day time, will admire their beautiful surfaces, though they are not covered with brilliant flowers and the more valuable crops of cereals.

CHAPTER V.

Temperature of soils. Distribution and circulation of heat.

§ 12. Every plant and every crop requires a certain temperature for its perfection; not that it requires exactly such a number of degrees of Fahrenheit, but crops and plants require for perfection a limited range of temperature, and this limited range may be

regarded in the light of a spécial latitude. The source of heat is the sun. Its rays penetrate or affect the soil in this latitude to the depth of probably 100 feet. At this depth a thermometer would remain stationary the whole year, being changed neither in summer nor winter. The summer's heat will not cause it to rise, nor the winter's cold to fall. In this space, in consequence of the continued action of the sun's rays in spring and summer, heat accumulates, especially in the upper beds of soil, and the roots of plants, and as the fall and winter set in, receive from beneath, the heat which has accumulated. The surface layers become cold as autumn advances, but beneath, the store which has accumulated keeps the roots warm, and probably tempers or mitigates the cold above. But the cold season expends the stock, and when the spring comes round with its showers, its buds and flowers, the sun's heat is found to be penetrating again the depths of soil with the same intensity as in former years. It cannot be affirmed that the season begins with a portion of the old stock of heat remaining, for in that case there would be ultimately a great excess of heat in the soil. Each year's observations give the same average results in the same latitude.

In the spring and summer the accumulation has a certain uniformity of increase and decrease. The increase reaches its maximum by the middle of August, when the heat of the soil diminishes, though sensibly, the temperature of the air remains for a week or two much the same as in the first part of the month. The stock of heat is gradually expended. The winter is undoubtedly milder and softer in consequence, and vegetation is thereby less exposed to injurious extremes of cold, especially their roots, which will be preserved alive in many instances, though the stem may be killed.

Surfaces, however, are affected differently. Water becomes heated much less than the soil, and to a certain extent we are safe in affirming, that its penetration is governed by the dryness of the surface and its color. A wet surface having the character of a sponge, will remain nearly as cold as a water surface. The principle is well understood; for as we have already stated water evaporates at all temperatures, but it cannot evaporate in the total absence of heat, but however cold it may be, the vapor which rises absorbs a certain amount of heat. The heat of a body saturated with water is kept cold by the escaping vapor. Pour ether upon

hand, or any other substance which vaporises rapidly, and a great degree of cold is felt. The hand parts with its heat or as it is technically called, its caloric, and it is precisely so with soil, with a sponge and the swamp lands of the Eastern counties. It is to the coldness of the surface or the vegetable mass caused by evaporation, that it has been preserved, and by which it is kept cool. The swamp lands, however, have a double protection; first, a thick forest, and an under-growth of water shrubs or grasses, and then the mantle of water for a part of the year, or for the whole year, a fountain of water which is sufficient to feed the spongy turf, or mosses of the surface. If water escapes in vapor from the surface, it is instantly supplied with more, just as a sponge is kept wet when its base rests in water and its temperature will not rise until all the water is evaporated. The following experiments establish the foregoing statements:

On the 21st of April, between 9 and 10 A. M., the temperature of the air was 72°.

The temperature of a water covered surface 64°.

That of a boggy place in the sun 10 feet distant, 64°.

At another similar place, 62°.

And at a wet grassy surface shaded in part, 62°.

Temperature of the soil imperfectly drained, 68°.

Temperature of a light colored granite soil well drained 70°.

Temperature of a red soil well drained at the surface, 74°.

Its temperature six inches deep, 68°.

Temperature of a black soil at the surface 90°; 3 inches beneath 82°; 6 inches beneath 80°; showing a gradual penetration of heat downwards. In January 22d, the temperature of the air was 41°; temperature of falling rain 45°; temperature of the earth 44° at the depth of 6 inches. The wet surfaces are invariable colder than the dry; the light are colder than the colored; and the black warmer than either.

The black surfaces were made so, by fine charcoal which was intermingled with a gray granite soil.

The black soils of the swamps when laid dry become sufficiently warm for the perfection of indian corn even when water stands in the furrows a part of the season.

The preservation of the body of vegetable matter forming the swamp lands is due to two causes: 1st, low temperature; 2d, the

exclusion of air containing oxygen, which is the agent which combines with the organic matter and forms with them humic, crenic, apocrenic acids, and which in their turn combine with ammonia, lime, magnesia, and iron, and which are supposed to be the food of plants.

The temperature of the earth from January 22d to April 21st has advanced from 41° to 68° – 70° . The color causing an increase according to its depth; and black soil at the depth of 6 inches reaching 80° .

At a later period it is sometimes found to rise to 120° when exposed to the sun when a marsh near by was only 67° .

From the foregoing facts we may readily surmise what is needful to be done to increase the surface as well as bottom heat. The most rude savage, if he had any idea at all respecting indian corn, would never plant it in a wet place; he would select a dry surface. But, having done this, it is not certain that in every case it would be possible to increase the heat of the soil by artificial means. However, as dark soils become warm in proportion to their depth of color, we may, under favorable circumstances, mix black substances with the soil, such as char coal and peat. Wheat grows better on a stiff red soil than a stiff light one. In most cases the color demonstrates that chemical action has progressed farther than in a light colored soil. In the former the iron has become, at least in a part of it, saturated with oxygen. One part may remain in a protoxide; and if there is organic matter in the soil this is certainly the case, as it deoxidizes the peroxide, a change which is supposed to be a very important one in reference to the formation of ammonia in the soil. In connexion with the subject of cold and warm soils, we may state a beautiful compensation with regard to the distribution of heat. The loss of heat by evaporation has been fully stated, but it may not have occurred to the common reader that the reverse takes place when this vapor condenses again as it is carried landward, and as the air hovers over the soil with its load of water, every object cooler than itself is moistened with dew, and the heat of this vapor is imparted to the surfaces on which it is deposited. When, however, equalization of temperature between the air and bedewed surfaces has taken place, it is no longer formed. The properties of air, whether as a carrier of moisture and heat, or as a moving body, are eminently adapted to

the wants of vegetation; they are what the farmer wants for his crops; doing that in the simplest and gentlest manner possible to supply the necessities of the infant plant. They are cooled in the hot sunshine by evaporation, and warmed by the dews of the evening, and are thereby saved from the chills which the absence of the sun tend to produce. Water, as most persons on reflection will perceive, is a material proper to our earth as much as oxygen, silix or gold; but heat is in one sense a foreign product, not to call it matter, originating in the operation of forces peculiar to matter. The great source of heat which the outward parts of the earth enjoys is derived from the sun. It is distributed by numerous agencies, but its nature is such that the heat of one year passes to the celestial spaces, and what is enjoyed the next is a new emanation from the sun and from the active agencies of earth. It is not, then, like water, preserved from year to year by a conservative force; but we are indebted for its continuation to the constant action of the sun and the terrestrial forces which are appointed to furnish it from their store houses.

These remarks, we are aware, have no connexion with swamp lands that we can perceive, and still they are not to be regarded as entirely useless, especially when taken in connexion with the remarks concerning the conservation of water and its perpetual residence upon the earth's surface and connexion with the atmosphere.

CHAPTER VI.

Swamp lands divided into six districts. The Dismal swamp district has not been explored. Diversity of composition of these lands. Elevated in the middle.

§ 13. The swamp lands of North-Carolina may be regarded as forming six districts. The first beginning on the north, is the Dismal swamp, which lies both in Virginia and North-Carolina. The

second is the Albemarle and Pamlico swamp district, lying between the Albemarle and Pamlico sounds. This large tract is of a quadrangular form and occupies large areas in Tyrrell, Hyde, Washington and Beaufort counties, and probably has the largest acreage of any swamp in the State. It is also the type of all the rest, and will by itself represent every variety of this kind of land which is found in either of the others.

The third is Bay river district, lying between Pamlico and Neuse rivers, both of which in their lower reaches, swell out into wide bays.

The fourth is Carteret county district, lying between the Neuse and Bogue and Core sounds. In this lies the great open prairie tract of eighty thousand acres, and which is owned mostly by the State.

The fifth is the Holly Shelter swamp, including Angola bay, lying between New river and the East Cape Fear.

The sixth is Green swamp, lying mostly in Brunswick county.

The Dismal swamp district has not been sufficiently examined to enable us to speak definitely with respect to its agricultural character. It is believed to furnish the characteristics of the other districts. A single analysis of a specimen of its soil in the early part of the survey, and which was procured within a few miles of Elizabeth City, gave results closely resembling those taken from Hyde county.

The examination of the second district has been much more extensive, having procured samples of soils from all sides of this extensive tract. This we have regarded as particularly worthy of attentive examination and illustration, as it furnishes the best types of soil with which the others may be compared. Those of Hyde county are the best known, and when it is found that a soil has a composition similar to those of this county, we are sure that they will be productive.

It is not designed to intimate in the foregoing statement, that this large tract has been crossed, or traversed extensively. It has been examined, however, in Tyrrell county, in Hyde, on both sides of Matamuskeet lake, in Washington and Beaufort counties. We have samples of soil which no doubt represent all the varieties which occur in this great tract. It is proper to observe in this place, that the swamp lands of this State present as much diversity

in composition as those of the middle or western counties. For example, as it regards the quantity of vegetable matter; some are composed almost exclusively of it, while in others, it is reduced to a minimum, and thereby scarcely differ from ordinary soils. We find between these, extremes of every imaginable variety in the quantity of vegetable matter, though to the eye there is a very close resemblance. Besides in the counties above named, there are large tracts which are well adapted to the growth of wheat, being composed of large proportions of clay, with only the ordinary quantity or per centage of organic matter.

There is still another interesting fact which should be noticed here inasmuch as it is applicable to all the large tracts of swamp land; it is, that they are all higher in the middle than upon the borders. This explains the fact why the streams all flow outward. They all originate in a culminating belt, or crown; and it is this interior belt, which gives in analysis the great excess of vegetable, while the outskirts contain a greater porportion of inorganic matter. This statement however, does not always hold good; yet it is so common as to be worthy of notice. Hence too in ditching, it is necessary to keep the cut level or down, so as not to run out in its progress towards the crown of the swamp. We shall also expect from the foregoing to find the vegetable matter increasing, and perhaps to be approaching to that extreme, that it will not be advisable to attempt to bring it into immediate cultivation.

The miner, in his trials for gold, follows if possible the lead to the vien, the great depository of metal; the farmer or planter, will proceed something in the same way, trying at short intervals the mass for the purpose of determining the quantity of earth, or soil which is intermingled with the vegetable matter, inasmuch as cultivation turns, we think, on the quantity which it contains, at least in the present state of our agricultural knowledge.

As many variations exist in composition, so it will be found that there will necessarily occur equivalent variations in value. In order to determine the value of any part of the uncultivated sections they should be compared with lands under cultivation and which have been proved by experiment. Certainly this course must be regarded as the safest, though we believe that it is not difficult to arrive at a safe conclusion provided the proper steps are taken to determine one or two points, the quantity of soil in the

mass, and its condition whether it is fine or coarse, or is made up entirely of marine sand. In this case it certainly is better than an entire absence of mineral matter; yet, if it is to be cultivated other elements must be added.

CHAPTER VII.

Composition of swamp lands stated. Hyde county. Natural crop is Indian corn. Number of plants to the acre. Quantity raised.

§ 14. The composition of the swamp lands, which now claims attention, will be as fully stated as seems to be necessary for a full knowledge of their peculiar properties. In doing this it is regarded as expedient to bring together all the analyses which have been made which are trust-worthy. As it regards those which were given in the report for 1856, they will be also restated as they have been re-examined and additional results obtained, which were necessary to make them complete. Hyde is an ancient county. It occupies the eastern part of the 2d district of swamp lands; is elevated only a few feet above the tide storms of the coast. The marsh lands everywhere skirt the best swamp land, but they are never included in those which are under consideration, even such parts of them which are only rarely overflowed by tides. They are too saline for the cereals, or the fine meadow grasses.

It is in this county that the durability of swamp lands has been tested. The records of the courts and reliable tradition show that certain tracts have been under constant cultivation over a century with a yearly crop of grains, principally indian corn, without showing a decrease in the number of bushels per acre or any diminution in the fertility of the soil. It is rather maintained that they improve under cultivation; and this is not surprising, because they are brought to a condition more favorable to vegetation in consequence of the free admission of air and the disappearance of

an upper surface too much charged with vegetable matter. Besides it becomes more compact, and is better able to support the heavy foilage. In a loose soil the roots are unable to sustain the foilage and keep it upright against the force of strong winds which sometimes visit the low counties. The roots are liable to be broken or injured in resisting its force. Though the soil is still to be regarded as light and loose, it is not spongy, and water rises through it as in other soils, though moisture is favored by the presence of a large amount of vegetable matter.

The color is black or dark brown, as already indicated, and the whole mass near the surface looks as if it was composed entirely of vegetable matter. We see no particles of sand or soil in it. On the sides and bottoms of ditches a light gray, or ashy soil is discernable. Indeed, it is regarded as ashes, and is so called, and is supposed to have been formed by the combustion of ancient beds of vegetable matter. The cultivated lands of Hyde are not chaffy, that is when dry, like tinder and liable to take fire from a spark or ignited by a gun wad. There are, it is true, tracts lying in connexion with them of this character, which are quite limited, but their occurrence does not affect this general characteristic.

The following substances with their proportional numbers express the composition of a soil which has been under cultivation three years. The tract is owned by Dr. Long, and is a part of an old plantation which has been under cultivation for more than one hundred years:

Organic matter,	46.10
Silex,	43.00
Oxide of iron and alumina,	6.40
Carbonate of lime,	0.21
Magnesia,	0.12
Potash,	0.16
Soda,	0.18.
Chlorine,	trace.
Soluble silex,	0.03
Sulphuric acid,	0.04
Phosphoric acid,	0.30
Ammonia,	0.09
Soluble organic matter,	2.00

98.60 .

The silex of this soil is exceedingly fine and of a drab color. It is too fine to detect with certainty its origin. When it is a grade coarser, it frequently contains particles of mica and felspar, indicating that the parent rock from which it was derived, were the common granites which skirt the low country, and which form a distinct belt, running nearly north-east and south-west. If this earth constituted by itself the main body of soil, it would be too fine, and form a mass too compact to admit the free penetration and circulation of air. In this respect it resembles the fine grained soils of some of the western States, and which are easily moved and blown into clouds by strong winds. The intermixture of vegetable matter makes it sufficiently porous, and by its agency preserves that open state so needful for the promotion of chemical changes, the development of carbonic acid, the deoxidation of the peroxide of iron and the absorption of ammonia. The lime does not probably exist in the condition of a carbonate; it is the state in which it is obtained; but probably as it exists in the soil it is in combination with an organic acid, which during the combustion is converted into a carbonate.

The alkalies are less in quantity than we should naturally expect from soils so productive.

But what at first appears remarkable, is the small quantity of chlorine and sulphuric acid. Both seem to be nearly absent; it is rarely that we attempt to weigh them. Whether their absence is due to the original wet state of the soil, we are unable to form an opinion. We should expect to find chlorine in a soil so near the ocean that during storms it must be taken up and carried inland, and from this cause it would be expected that it would at least appear in a per centage as large as in soils a hundred miles from the ocean.

The composition of the subsoil it will be seen differs from the former, taking a quantity two and a half feet from the top from the side of a ditch free from growing vegetables we found it had the following composition :

Water,	7.50
Insoluble organic matter,	16.30
Hunic acid or soluble organic matter,	3.70
Silex,	59.88

Alumina,	7.90
Peroxide of iron,	2.10
Carbonate lime,	50
Magnesia,	32
Phosphate of lime,	50
Potash,	15
Soda,	12
Silicic acid,	14
Ammonia,	09

 99.10

The color of the subsoil after drying is brown and particles of fine sand are distinguishable. It often shows light or gray patches which are regarded as ashes derived from ancient combustions. It is due to the inorganic matter which gives a lighter color to the mass. The soluble organic matter is large in this instance. The quantity of ammonia is smaller at this depth than at the surface.

The constitution of this part of the soil is excellent, possessing all the elements which are necessary for the growth of crops. The specimen for analysis was taken about midway between the top and bottom of the mass of soil; below, it preserved the same composition apparently or so far as mechanical exploration could furnish information, though it is probably more highly charged with soil as it seems to increase with depth. But taking the whole mass of soil which is about six feet deep at this part of the plantation and not less elsewhere, there is in sight a large store house of matter to sustain the crops, or any future vegetable growth.

§ 15. This plantation, which has been under actual cultivation for a period sufficiently long to test most thoroughly the capacity of the Hyde county soils for endurance, is at present the property of Dr. Long of Lake landing. Its ownership can be traced back for six generations, and the crops which have been removed have necessarily been confined to the cereals and probably Indian corn, with an occasional crop of wheat, which is cultivated for the purpose of occupying the land with something more profitable than a heavy growth of weeds. It is necessary they should be excluded by occupation.

The composition of a sample of this soil, which has been so long under the plow, has been determined with the following results:

Water,	8.90
Silex,	59.00
Insoluble organic matter,	18.80
Humic acid or soluble organic matter,	3.40
Peroxide of iron and alumina,	8.00
Carbonate of lime,	0.10
Magnesia,	0.09
Potash,	0.04
Soda,	0.08
Silicic acid,	0.20
Phosphate of lime,	0.62
Sulphuric acid,	trace.
Chlorine,	trace.
Ammonia,	0.25
	<hr/>
	98.96

This soil is shown to contain less organic matter than the first, and a larger proportion of silica. The first element must necessarily diminish under cultivation more rapidly than can be accounted for by removal in the crop. It is consumed by exposure to the elements, undergoing a change analogous to combustion, and which Liebig has termed *eremacausis*.

The quantity of corn which is cultivated per acre, is reckoned by the number of plants allowed to stand. The common rule in Hyde county, we believe is to cultivate fourteen thousand per acre; and it is common to allow two or three plants to grow in a hill. A crop made up or consisting of such a number of plants per acre will give a stranger a correct knowledge of the capabilities of the soil. But it should be observed that the immense growth of foliage with stalks is somewhat out of portion to the grain, and it appears, that maize, growing in a very rich soil, runs somewhat to foliage, though not to the excess which is observed in oats, wheat and other cereals. The height of the corn, upon an average, is 12 feet high. The grain is rather lighter also than northern or western corn, and the ears, taken as a whole, appear rather less than when grown upon soil with less vegetable matter.

The usual crop is between 10 and 12 barrels of 5 bushels, to the acre. If heavy winds in the early part of the season, or other agents act unfavorably, it will be diminished to 9 or 10 barrels per acre, while in favorable seasons it reaches twelve barrels.

The result may not strike a person as remarkable; but it should be considered that no manure is called for, and the simplest and cheapest mode of cultivation is all that is required to make a crop of this standard, and this is the common result, without an expenditure in money and labor for manure. Therefore, there is a larger profit, though it is not uncommon to obtain a larger yield, but it is done at a heavy expence in fertilizers and labor.

§ 16. The soils analyzed as stated in the foregoing paragraphs, were taken from the south side of Matamuskeet lake. The north side is usually regarded as better land. It is not, however, fully established that this opinion is well founded. The differences are slight, if any. The composition of the soil of the north side is certainly much the same, as we believe. The following is a statement of the composition of a portion of soil from the plantation of Mr. Burrows, taken at a depth of eight inches. It had been under culture for three years:

Water,	12.30
Insoluble organic matter,	38.80
Humic acid, or soluble organic matter,	3.20
Peroxide of iron,	3.70
Alumina,	5.10
Silicic acid,	0.40
Carbonate of lime,	0.48
Magnesia,	0.27
Potash,	0.18
Soda,	0.10
Phosphoric acid,	0.12
Chlorine,	trace.
Sulphuric acid,	trace.
Ammonia,20
Silex,	34.60
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	99.05

The lands of Hyde follow the same rule respecting the presence of chlorine and sulphuric acid, as all the swamp lands of the eastern and southern counties. Their absence is not satisfactorily accounted for, unless it is due to excessive moisture, or to their removal by constant contact with water. The timber of the soils of the Matamuskeet country are black gum and cypress, both of a

large size. Large pines and poplars are not uncommon, and all are regarded as indicative of a rich soil. This opinion is undoubtedly true, and may be relied upon. It is, in fact, perfectly compatible with all the arrangements and conditions required. While the timber of the poor tracts bear trees of a small size, of a different kind, appear dwarfed or starved, for want of nutriment. The poor soils also bear upon their surfaces indications equally compatible with the conditions in which they are connected, but in the latter it is perhaps a condition which may be greatly improved.

§ 17. It will be useful in passing, to compare the swamp lands with the prairies of Illinois, or any other tract of the great west, whose characteristics have drawn westward so many emigrants from New England, New York and the old world.

The soils of the prairies have a great natural fertility, and which it is supposed by many are so excessive that they will bear cultivation for thousands of years, though not without the aid of fertilizers. Large tracts in Europe, Lombardy, for example, have yielded crops for two thousand years. But Lombardy yields her crops, and has done so from time immemorial, by the aid of fertilizers, and which are husbanded in a manner and with a care, which is unknown out of that country. Calculations are made to a penny, what a pound of any given fertilizer is worth. It is a money article. The long period during which Lombardy and England have been cultivated, and are still productive, proves the value of the basis of the soils upon which agriculture has rested.

§ 18. A prairie soil of Illinois is usually black, or brownish black and friable, from an intermixture of earthy or sandy matter. It has a basis or subsoil of a stiff yellowish clay, and such is the nature of this soil, that it has borne a succession of crops of maize for thirty years, and even more, without manure. These lands are better adapted to maize than wheat, and partly so for the same reasons that this crop succeeds better in all the swamp lands than wheat. Besides, the open prairies are swept in the winter by strong chilling winds, which injure wheat by rooting it up. Such influences must bear annually upon lands thus exposed. The crops of corn are larger than in Hyde county, but whether they sell for as much money, is quite doubtful. A prairie crop often reaches a hundred bushels per acre. The farmers of Hyde seem

to be contented with 60 bushels per acre, and at the same time we see no reason why they too might not increase it to 100 bushels. The composition of the prairie lands furnish some differences, but there is so much uniformity that they appear to form only one class.

§ 19. An example or two showing the composition of the best of the class will suffice for a comparison with the Hyde county corn lands. Thus, the best kind consists of:

Organic matter and water in combination,	9.05
Alumina,	3.38
Oxides of iron,	4.30
Lime, .....	.54
Magnesia, .....	.35
Potash, .....	.19
Soda, .....	.08
Phosphoric acid, .....	.10
Sulphuric acid, .....	.08
Carbonic acid and traces of chlorine, .....	.09
	<hr/>
	100.00
Ammonia,	41
Containing nitrogen,	34 Prof. Voelcker.

§ 20. Prof. Voelcker remarks* that the soil is not rich in phosphoric acid, but still, there is an ample store to meet all the requirements of the plants usually cultivated upon the farm. The great and important distinction in the composition of the prairie soil and swamp lands, is the great excess of vegetable matter in the latter. The prairie soil possesses no advantages in point of composition with respect to the expensive elements, *phosphoric acid, potash, soda, lime, etc.* The prairie lands must necessarily require fertilizers at an early day, while the magazine of food in the swamp lands will require centuries before it can be consumed, even under constant cultivation.

Another variety of prairie soil analyzed by Prof. Voelcker is regarded as less fertile than the preceeding. It is composed of:

* *Prairie farming in America*, by James C. Caird, M. P.

Organic matter and water of combination,	5.76
Alumina,	1.57
Oxide of iron,	2.57
Lime,	35
Magnesia,	40
Potash,	33
Soda,	trace.
Phosphoric acid,	05
Sulphuric acid,	05
Carbonic acid, and traces of chlorine and loss,	53
	<hr/>
	100.00
Ammonia,	0.31
Containing Nitrogen,	0.26

The proportion of nitrogen, says Prof. Voelcker, is less as might be expected from the smaller quantity of organic matter. However, two tenths per cent. is regarded as a large proportion though when expressed in fractional numbers it appears insignificant, yet when it is known that the weight of soil, ten inches deep upon an acre amounts to a thousand tons in round numbers, the quantity of nitrogen in an acre of soil existing in this proportion will be about two tons. A crop of wheat of 36 bushels to the acre with its straw, contains fifty two pounds of nitrogen, and a crop of Swedish turnips only about thirty-six pounds.

In this connection it will be instructive to many to see the composition of a rich wheat soil of Scotland analyzed by Prof. Anderson. It is from Mid Lothian and consists of:

Organic matter and water,	10.19
Alumina,	6.93
Oxides of iron,	5.17
Lime,	1.22
Magnesia,	1.08
Potash,	0.35
Soda,	0.43
Phosphoric acid,	0.43
Sulphuric acid,	0.04
Silica,	71.55
Water,	2.58
Carbonate acid and loss,	0.03
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	100.00
Nitrogen,	22

§ 21. Several analyses of swamp soils have been made, which, at the time, were regarded as owned by the State, but subsequently we were informed were taken from the lower part of the valley of the Mississippi. They were furnished by the Hon. B. F. Moore of this place. It is impossible to find marks by which No. 1 may be distinguished from a Hyde county soil. They were numbered up to seven. No. 1 is black and fine, showing that the vegetable matter has passed into the condition of well formed peat. It gave, on analysis :

	No. 1.	No. 3.
Water,	14.50	2.50
Organic matter,	51.79	6.00
Alumina and oxiron,	3.63	3.50
Silex,	28.20	87.50
Lime,	1.00	0.20
Magnesia, .....	.50	.10
Potash, .....	.07	undetermined.
	<hr/>	<hr/>
	99.69	99.80

No. 3 corresponds to some of our best gall berry lands, which are low and wet ; it has a drab color, and a fine silicious base, and is a tolerable good soil.

Another which is still more sandy, and less coherent, resembles our gall berry soils and must rank with poor soils. It consists of:

	No. 6.
Water,	2.00
Organic matter,	2.00
Silex,	90.00
Oxide of iron and alumina,	4.00
Lime,	8.40
Magnesia,	0.06
Potash and soda,	undetermined.
	<hr/>
	99.46

The organic matter of No. 6 is reduced to the minimum quantity of excessively sandy soils.

These analyses from a distant part of our country are introduced for the purpose of noticing a fact which is not uncommon in soils

of this class. It is the occurrence of poor patches in the midst of No. 1, which is a rich and productive soil. But these spots of barrenness bear the plant until it is a foot high, when it turns yellow and dies. This kind of material is loose and chaffy; it contains 65 per cent. of vegetable matter, but it is loose and rather coarse, and probably furnishes one reason why vegetation dries up so early. It is not deficient in inorganic matter, but growth requires a body of soil which has firmness, but it is possible that these barren places contain the astringent salts of iron and alumina. There are several places in North-Carolina where the vegetable matter contains an acid salt of iron, which destroys corn or any other vegetable productions when it is placed in contact with them.

§ 22. A practical method for obtaining a sufficient knowledge of the swamp soils to enable the owner or purchaser to form an opinion of their value, and which may be performed by any person possessed of patience and care, is by adopting a mechanical process. Take about a pound of soil, with or without weighing, and with water in a clean dish or saucer, and then with the fingers rub the mass fine; allow it to settle, pour off the black liquid and the matter which floats in it. This consists of vegetable matter separated from the mineral. The operation is to be repeated as long as the water is discolored, being careful not to pour off or waste the soil. After several washings the fine sandy particles begin to appear in all the best soils. If, however, the soil is poor, white coarsish sand will appear in place of the gray fine material, which characterises the Hyde county soils, or those which are similar to them. The operation is by no means difficult, but requires care to save the soil when it is fine; indeed, one-third of it will probably be lost in the most careful performance of the process, but enough soil will be obtained to show its character even though the operation is hastily performed.

Two results, obtained mechanically, will be given in this plan. The first is Dr. Long's soil, which had been under cultivation over a century, and the second a soil from the north-side of the lake.

Thus 100 grains, on being carefully washed by the foregoing method, gave:

Very fine soil,	41.0
Fine sand or soil,	18.0 grs.
Vegetable matter,	22.00
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	81.00

The result shows that more than one-half is very fine, the remainder less so. The soil, under the microscope, showed scales of mica and grains of felspar, which indicate a derivation from granitic rocks. On being heated to redness the whole becomes a drab color.

The soil from the plantation of Mr. Burrows, on the north side of the lake, treated in the same way, gave:

Very fine soil,	28.40
Fine,	16.20 grs.
Vegetable matter,	47.90
	<hr/>
	86.30

The color was a light gray, and on being heated to redness was only slightly redened. There again the loss was about one-half, as when the vegetable matter is consumed, it leaves 44.30 per cent. of a compound which is mostly silica, which, as in the former specimen, is extremely fine.

§ 23. In order to show the difference between a rich soil and one which is comparatively poor, we shall place one of the latter in this connexion. It is from the Carteret county lands or the open prairie. Thus, on mechanically separating the inorganic matter, we found:

The coarse part amounted to,	27.00 grs.
The fine " " "	7.58
Organic matter,	44.22

The fine and valuable part bears a small proportion to the coarse which can scarcely be relied upon for furnishing nutriment. However this may be, it is useful in assisting to give solidity to the mass of vegetable matters.

We propose to introduce, in this connexion, the remarks of Messrs. D. Simmons & Brother, of Hyde county, accompanying

two analyses of soils by Prof. N. B. Webster, of Portsmouth, Va. They were marked A and B. The first consists, according to Prof. Webster, of:

Moisture, when air dried,	14.00
Vegetable matter,	58.00
Silex, very fine,	14.00
Alumina, .....	.06
Oxide of iron, .....	.03
Lime, .....	.01
Potash and soda, .....	.01
Loss, .....	.03
	<hr/>
	86.04

We have copied the analyses from the North-Carolina Farmer, and probably there is some mistake in figures, though the apparent error may lie in mistaking the quantity used in analysis.

The composition of sample B is stated as follows:

Moisture, when air dried,	13.00
Carbonaceous matter,	68.00
Silex,	14.00
Alumina,	0.06
Oxide of iron,03
Lime,01
Loss,	4.00
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	100.00

The information derived from Messrs. Simmons, distinguished for their successful farming and large crops, is as follows: The sample A was taken from an 80 acre field, lying on the north shore of the lake, and running back half a mile. This land had been in cultivation about 20 years, and produces now, in a fair crop year, 10 to 12 barrels of corn per acre. The sample B was taken from a 640 acre tract, lying back of the 80 acre field. It has been in cultivation five years, and produces, in a fair crop year, from 10 to 12 barrels of corn per acre. These lands lie between Matamuskeet and Alligator lakes, four miles distant from Alligator river. Alligator lake is said to be 10 miles wide and 15 long, and from 3 to 5 feet deep. It lies nearly in the centre of the county. It is sur-

rounded by a ridge from 4 to 6 feet above the sheet of water. The back lands are drained into Alligator river on the north, and into Palmico sound on the south. The cultivated lands on the north side of Matamuskeet lake run back about two miles, and are very uniform in quality. The north side is the best and deepest soil. Indeed, it may be said the county is a garden spot. It has a population of 5,000 to 6,000, and ships from 500 to 600 thousand bushels of corn, and some 50 thousand bushels of wheat per annum, to which may be added large quantities of peas, potatoes, &c."

§ 24. RECAPITULATION *respecting the Hyde county soils.* Their peculiarity consists, 1st, in the extreme fineness of the soil proper, or the inorganic matter. This is of a drab color, and shows by itself a good composition; that is, it proves that it does not consist of a pure marine sand, but that it contains all the common inorganic elements, iron, silica, alumina, lime, magnesia, etc. Those which consist of marine sand alone, and which express by themselves barrenness, have an inorganic matter which is white, and any person of ordinary capacity will recognise this element, which, though necessary, is not sufficient by itself to supply the wants of vegetation; it is simply defective in other important matters. Acids, however, acting upon even the white sand, dissolve a fractional part, showing the probable existence of a small quantity of felspar intermixed; and hence, even, in the case of the presence of a white sand, a few crops may be grown.

The great amount of organic matter is a common characteristic; and its presence serves only to distinguish this class, the swamp soils from the upland soils.

Hyde county soils show a greater capacity for endurance than the prairie soils of Illinois; notwithstanding the annual crop of maize is somewhat less per acre. But on the score of location we are unable to see that the Illinois soils have a preference. As it regards health, Hyde county is no more subject to chills and fever than the country of the Prairies. It is a remarkable fact that persons live and labor in swamps with impunity, or freedom from disease. A large amount of vegetable matter, when exposed to the sun, usually generates miasmata, but the common mode pursued for cultivation of the soils of Hyde county will not expose a greater surface, or a greater amount of vegetable matter than is exposed in the breaking up of prairie grounds; and those grounds

when first exposed, or for several years disengage miasmata and generate in the exposed inhabitants chills and fevers. Precautions in both sections of country, no doubt, will enable persons and families to counteract their injurious influences, in part at least, and thereby escape the attacks of fever.

The origin of the soils of Hyde county may be traced to granitic rocks, either granite or gneiss, whose composition is precisely similar. Finely abraded materials being transported from the interior by rivers which frequently overflowed their banks, and distributed thereby the fine soil over low grounds, upon which plants of various kinds were growing. In certain poor tracts, however, coarse sand was admitted and distributed more rapidly, but still over a surface supporting coarse grasses and mosses. As all of the eastern counties were at one time submerged tracts, and received deposits of sand while beneath the Atlantic, it has no doubt often happened that these marine sands have been subsequently disturbed and the sand redistributed by rivers.

§ 25. The position of the great swampy tract to which Hyde county belongs is between the lower reaches of the Roanoke and Palmico sound, a position which shows very satisfactorily what must have taken place in early times when the land was a few feet lower than it is now. We may regard all the tracts which possess a gray or drab colored soil as having received it from the interior, while the clear white sands, which often appear under the microscope as ground crystals, are probably derived from marine beds which have been assorted or sifted by the action of waves. It is by no means an uncommon circumstance that river currents, with their burthens of comminuted rock and tides bearing forward sand meet and commingle their contents, and some varieties of soil are actually composed of the fine and coarse as if they had been mixed in the way we have indicated.

§ 26. The principal fact we have to bear in mind is that soil mixed with vegetable matter is absolutely necessary for the growth of plants. The black peat, if destitute of soil, will not sustain a crop, it necessarily perishes, and the time during which plants or crops of the cereals can grow and perfect seeds or fruit depends directly upon the amount of soil the peat contains combining the necessary elements in due proportions.

CHAPTER VIII.

Position of Plymouth. Quality of soils indicated by the growth of timber. Cost of drainage. Composition of four specimens of soil from the south side of Albemarle sound. Mechanical separation of elements, etc.

§ 27. PLYMOUTH is a place of some note upon one of the south divisions of the Roanoke, and above its entrance into Albemarle sound some ten miles. It is upon the north side of the great swamp, to which the Hyde county lands, which have been under consideration, belong.

In its vicinity are lands which are owned by gentlemen of Raleigh, and who are now making inroads upon the desert swamp in the way of drains and ditches, aided by the axe and grubbing hoe. Their lands, which are not far from Plymouth, are in an easterly direction, and appear, so far as externals are concerned, closely related to those of Hyde county; but as we have already stated, the swamp lands of North-Carolina are as variable in composition as the uplands; and hence, the necessity of an analysis of some kind to prove or determine their characteristics. It is indeed, highly probable that there is more danger of misjudging of their qualities by simple inspection, than of the uplands; for the vegetable matter masks their essential characteristics, or those characteristics by which their ability to bear crops depend. It is true, that timber in kind and quality, furnishes a clue upon which to found a judgment; and following this guide, it is very probable that good judges would make a wise choice of lands; for it is so fitting that certain trees of a large and portly size should grow upon a fat land, and dwarfish ones, with stunted limbs and mossy trunks, should belong to a lean soil, in which there is a great scarcity of the money elements, that it seems to be an axiom in the vegetable economy. It is as much established in the vegetable kingdom as in the animal, that fatness and size is due to full feeding, while leanness is due to a lack of nutriment, provided the organs of assimilation are in a healthy state. We look upon the specimens from the north of the Albemarle and Pamlico swamp as representative of that side, as they were taken from a tract of seven or eight thousand acres. However this may be, it is necessary to keep before us the characteristics of those lands which we know to

be good, and which have been amply tested. We ought, however, to bear in mind that tests by actual crops may be sufficient to satisfy practical men, but the results of these very tests harmonize perfectly with well known principles. To the minds of those imbued with principles, the results are precisely what they would have predicted, they would say *a priori*, what the results should be. State the facts truly with respect to the soil, and they would predict results. We have then, two sources of information for our guide, *principles* and *tests by experiment*. Principles have certain advantages over tests, as they determine for us before hand, or prior to the application of labor and the payment of money; and hence, may be resorted to when tests by experiments are not convenient and require more time than can be devoted to the matter.

§ 28. The first work which is necessary to subdue a swamp and bring it under cultivation is to draw off the water by drains, and then to kill the trees by *girdling*. The timber when girdled is allowed to stand until dead.

We have been unable to ascertain the expense of subduing swamp lands by draining and clearing. In this State it is generally undertaken by the owners of hands. The highest price we have heard being paid is 16 cents per cubic yard for cutting deep and wide ditches. This is more than the work will cost usually; especially when it is undertaken by the owner, with good hands. The task for a smart negro is to cut 400 cubic feet per day, and one who is industrious finishes it in season to save at least one full day of the week. In draining systematically, lots are laid out in squares of ten acres each; ultimately the water finds its way to the drains and leaves the surface sufficiently dry for cultivation. It is not expected that the surface will be dried the first season, and no profits are obtained the first two years. Corn, however, grows upon the ditches and upon the area drained soon after the mass has settled even among the dead trees after the underbrush is removed. In consequence of the heavy expense attending the subjugation of a swamp, it is necessary that the person who embarks in it, should possess capital, for it is not simply the first cost which is to be met, but the expenditure has to remain unproductive for two or three years. There is the cost of supporting the hands employed for the time, the interest of the money, and perhaps the outlay for the land, all

of which, either requires cash, or good credit based upon a cash reputation.

The timber immediately shows the effect of drainage and girdling, but it is not intended to apply the axe generally to the large trees. The roots of the gum speedily decay. The tree is spongy and almost like cork; and hence, rots earlier than the cypress. As a general rule, the work of clearing is not so formidable an undertaking as it appears it would be on the first inspection of the towering cypresses, the woods are soft and unlike the oaks, maples, birches, beeches, etc., of a northern forest. We believe that the cost of clearing these lands is less than those of the North, or the well wooded uplands of the South, but we have only insufficient data to form a correct opinion. The difficulty is, very few persons keep a book of expenses for work of the kind, and besides, we believe that as clearing really extends over a period of many years, it is impossible to estimate it. Nature is left to perform as much of it as possible.

§ 29. The section from which the soils were taken, the composition of which we propose now to give, is situated upon the branches of Kendricks creek. This short creek rises in the dismal and falls into the south-side of Albemarle sound. The section is regarded as a part of the Hyde county tract, and to be continuous therewith. We shall give the composition of only four specimens, as they seem to represent the condition and character of this part of the swamp. The first is a brown or grayish brown color and would be pronounced, on inspection, a fertile soil. On drying it concretes into small lumps, which, however, are easily crushed. It shows no sand or soil proper, the vegetable matter being in a sufficient quantity to mask or conceal it, but being rubbed between the fingers, or taken between the teeth, its grittiness is at once perceived. The latter method of trying the swamp soil is a very good one, as if present it will be detected and something relating to its fineness or coarseness revealed. This is numbered 4, and on analysis it gave:

Water,	24.000
Silex,	48.000
Organic matter,	18.000
Peroxide of iron and alumina,	8.900
Lime, .....	.220

Magnesia, . . . . .	.100
Potash, . . . . .	.177
Soda, . . . . .	.060
Chlorine, . . . . .	.090
Sulphuric acid,	trace.
	<hr/>
	99.447

The silix and inorganic matter is of an ash color, and it is proper to observe in this connexion that the iron is in the condition of a protoxide, being white when precipitated, and resembles alumina unless it is oxidised by nitric acid. It differs from many soils in the color of the oxide, as in some cases it has the pertoxide color and then it is greenish. The organic matter in these cases of uncultivated and recently exposed soil has deoxidised it to its lowest state of oxidation, and this fact illustrates very conclusively the influence of inorganic matter in soils. When they have become dry and exposed to the atmospheric agents a part of the iron becomes oxidised, but being always present in a mass of vegetable matter it is again deoxidised under favorable conditions. A succession of changes of this kind take place which as water is decomposed hydrogen is set free, and may, when liberated, combine with nitrogen and form ammonia.

This variety of soil is rather upon the rim of the swamp, but it occupies an exceeding large space. The analysis was made upon the specimen which had not been dried in the open air, and shows the amount of water which it naturally holds. But this large percentage of water, it will be perceived, diminishes the ratio of the other important elements; and hence the true value of this variety of soil is not expressed in its most favorable light.

The examination of this area of soil suggests its adaptation to cotton. We have seen cotton growing luxuriantly and well supplied with bolls on a similar soil in Carteret county. In the constitution of cotton we can see no objection to a complete success on this soil.

About one-fourth of a mile from the outer rim we find the mass to be richer in vegetable matter or to increase in quantity towards its interior. The specimen is black, fine grained material, but contains unchanged stems of vegetables, or those but slightly blackened. It is a true peat, in most respects to the eye. We took of this

sample numbered 2, two hundred grains and found it composed of:

		PERCENTAGE.
Water,	100.000	50.000
Silex,	39.000	19.500
Organic matter,	54.100	29.050
Alumina,	4.52	2.26
Peroxide of iron,	1.09	.54
Lime, .....	.781	.391
Magnesia,160	.040
Potash,177	.088
Soda,088	.044
Chlorine,090	.045
Sulphuric acid,	trace.	trace.
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	199.335	99.978

The texture of this specimen is looser than the foregoing. In drying, it concretes and forms rounded lumps which is a favorable indication of its condition, for one composed entirely of vegetable matter dries differently.

The great excess of water in this variety bears unfavorably upon its composition provided it is not left out of the account, but it is plain when drainage shall have had its full effect upon it, the ratio of all the important elements will be greatly increased. Taken all in all, this soil is rich in productive elements, and will be found equal to any of those in Hyde county; for as we have found by ample observation, the only draw back to a successful cultivation is the absence of soil, or inorganic matter. The necessity, however, of compactness, to give roots a firm hold of the earth is important. Certain kinds of swamp lands remain loose and rather chaffy after they are drained. It is indicative of the absence of soil proper, and when they are exposed to sparks of ignited matter they catch fire like tinder, and burn until extinguished by the exhaustion of combustible matter or are put out by long continued rains.

§ 30. For mechanical analysis of the foregoing, 100 grains were taken and carefully washed:

We obtained sand,	3.00
Very fine soil or sand,	16.25
Organic matter,	27.05
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	46.30

There is, therefore, a great predominance of very fine inorganic matter in the foregoing, which is rather remarkable; it however, goes to sustain the opinion which has been formed of it; the finely divided matter being in sufficient abundance to last for centuries.

The first soil of which we gave the composition gives, as well be seen, a much larger proportion of the coarser particles of soil. Thus we obtained of:

Coarser particles,	15.00
Very fine,	41.00
Organic matter,	18.00
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	74.00

The coarser particles consisted of limpid quartz, mixed with felspathic looking particles, the former greatly predominating. Although the extremely fine particles are in part quartz, yet it is highly probable that as felspar is softer and suffers more from abrasion that they are mostly felspathic, and hence, will furnish in the course of time, inorganic elements as food for crops. The fine silica in its condition of fineness is also in a state to be acted upon by alkalies, and thereby become soluble and fitted to be taken into the organism of plants.

The condition of a large part of the inorganic elements is to be regarded in the light of a reason why these soils are so productive in maize.

Another specimen of swamp soil from this district, and from a spot still farther removed from the outer rim than the preceding, gave results somewhat different. It is numbered one, and yielded the following elements on being submitted to analysis:

Water,	75.60
Organic matter,	16.00
Silex,	7.60
Peroxide of iron and alumina, .....	.30
Lime, .....	.40
Magnesia, .....	.10
Chlorine,	none.
Sulphuric acid,	none.
	<hr/>
	100.00

The small per centage of inorganic elements in this specimen is due to the great excess of water. If calculated dry, they would amount to about 35 per cent., and each individual element would be increased in proportion. But soils of this composition, especially when connected with water beneath, never become actually dry, but will contain at least from 8 to 10 per cent. of water. This tract, with the composition then as thus indicated, will contain inorganic matter amply sufficient for cultivation. The process of draining in this instance had just begun to take effect, and hence, the amount of water which these lands hold in their natural condition is exhibited.

By mechanical separation of the parts of this soil, it gave:

Coarsish soil, mostly quartz,	1.70
Fine soil,	7.30

Were the fine soil stated in the ratio it will exist after it is perfectly drained and dried in the sun, the amount will be so changed in the relative quantities, that no one will doubt that it can sustain a large growth of corn, or other crops suitable to this class of soils.

The last of this series is No. 3. It consists of earthy matter in a fine state of division, but in which we found a particle of quartz as large as a duck shot, which is uncommon in soils of this description. It contains also partially decomposed sticks or wood. It gave, on analysis, as taken from the tract, with only a slight effect from draining:

Water,	68.80
Organic matter,	24.91
Alumina and peroxide of iron, .....	.56
Silex,	4.50
Carbonate of lime, .....	.20
Magnesia, .....	.10
Chlorine, .....	.07
Sulphuric acid,	trace.

After exposure to the air for a month it lost water, and hence the proportion of the elements were relatively changed. The soil as first submitted to analysis shows the large amount of water it is capable of holding for some time after the drains have been cut.

The following analysis shows the amount of water lost, which certainly escapes slowly as it has been exposed freely to the air in a dry room for four weeks:

Water,	50.80
Insoluble organic matter,	22.00
Soluble organic matter,	10.80
Inorganic,	16.10
Phos. lime and magnesia dissolved by carb. of ammonia,	1.20

Tried mechanically for inorganic matter, it gave:

In coarsish sand or soil,	8.50
Very fine soil,	7.50

The constitution of this whole tract, so far as the soils collected can be relied upon, prove that it is closely allied to the Hyde county or Matamuskeet lands. There is really no deficiency of inorganic matter, and it is highly probable that cultivation for half a century will improve it. One objection to soils of this description is the loose state of the surface from the presence of undecomposed wood, and hence an insecure condition of maize in a storm of wind and rain. It is highly probable that it will be improved by a heavy roller, or by any measure which will give solidity to the surface.

CHAPTER IX.

The Pungo tract. Gen. Blount's plantation. . General description of this part of the Albemarle swamp, with its natural growth of timber. Depth and composition of the soils of this section of the swamp. Mechanical separation of the parts of the soil. How the poor soils of this class may be improved. Tyrrell county. The centre of the Albemarle tract highest in the centre.

§ 31. Pungo lake, a small sheet of water, is nearly the centre of

the great Albemarle and Pamlico swamp. From near this little sheet of water numerous sluggish streams depart; some to Albemarle sound, others to Pamlico, and others still, which flowing at first more easterly, drain the centre off towards Hyde county, where finally they take a northerly direction, and flow into Albemarle sound, by Alligator river. Pungo lake appears to be the culminating point of this great tract, where the swell of the crown attains its maximum, and hence, it is here that we should expect to find the most vegetable matter with the least soil.

On the Beaufort county side, or perhaps we should say Washington, which is its capitol, we have the north-west rim or margin. The travelled part of this country is along the north side of the Pamlico sound, where the land has the firmness necessary for a road; but a little north lies the drowned lands, which on being traced eastwardly, carry us back to Hyde county.

Many plantations have been reclaimed from the Beaufort side, while the attempts to work successfully the lands about Pungo, have not been eminently so.

The most successful planter of Beaufort county, and probably of the State, is General Blount. He is the successful pioneer in subjugating the swamps, and probably saw at an early day their great and intrinsic value, and has made a large fortune by their cultivation, and is now the owner of 50,000 acres. It is true, the productiveness of the Matamuskeet lands was indicative of the nature of other swamps, but still it seems to have been held that they were very peculiar and confined, and that planters need not expect equal advantages out of this region, and it has taken time to satisfy the public that rich lands of this class exist elsewhere. What has contributed very considerably to depreciate their value have been the failures to cultivate the poorest tracts, and the management of experiments to determine something satisfactory to owners has often been trusted to incompetent parties.

§ 32. The specimens which have been submitted to analysis for the purpose of determining the character of the dismal upon its southern margin, or northwestern margin, if we depart from Plymouth, were procured from Gen. Blount's plantation. The examination of so large a field rendered it necessary to select samples from known places. It is not, however, possible to carry such investigations over the whole ground. A life time would scarcely

suffice for this. Neither do we deem it necessary; for, though there are several kinds of soil which possess marked differences in their composition, yet, there would be unnecessary repetitions of facts; for it seems to us there are only a few points which require to be fully established, though they should be placed before those who are any ways interested, in such a light, that these points may be determined by themselves.

§ 33. Gen. Blount's plantation is at Madisonville, 12 miles from Washington, and is located upon the margin of the swamp. The general run of the timber is black gum, of which there is a heavy growth in many places, large poplars and maples, which are usually scattering, and short leaved pines; and when the land falls off in fertility, there is a growth of laurels.

The depth of the vegetable covering, rarely exceeds thirty inches. Its general appearance is much the same as that of all lands of this class, being black, wet and spongy, while in their natural condition. They are based upon a subsoil which is argillaceous, but not so close and compact as to retain the water.

The crops have not been confined to corn. Oats, though not eminently productive, have succeeded very well; the poorest fields yielding from 30 to 40 bushels per acre. In seasons less favorable for this grain, it falls to 20 bushels per acre. The corn crop has averaged forty-five bushels to the acre. Gen. Blount states in a letter published in the report for 1858, that he had raised one hundred and twenty bushels of corn to the acre on a plantation in Hyde county. This result is one which is not surprising, and it shows the lands of this class are fully equal in productiveness to the prairie lands of Illinois, of which we have given some account in a preceding paragraph.

Another fact mentioned by Gen. Blount is of great importance, is that for the forty years, during which he has been a resident upon this class of lands, the health of his family, white and black, will compare favorably with the healthiest locations in Eastern North-Carolina.

Only four specimens from Gen. Blount's plantation have been analyzed.

No. 1. Is a dark soil, and has a depth of twenty inches, resting upon a subsoil with argillaceous matter, but not sufficient in quantity to form an impervious mass. It is intermixed with sand. The

land bore a heavy growth of black gum, with poplars, maples and a few laurels, and in which there was a mixture of the short leaved pine. It bore 50 bushels of corn to the acre, and had been under cultivation three years. It gave on analysis:

Silex,	65.540
Hunic acid or soluble organic matter,	2.30
Insoluble organic matter,	23.70
Water,	6.050
Oxide of iron and alumina,	4.920
Carbonate of lime,	0.490
Magnesia,	0.050
Potash,	0.003
Soda,	0.020
Phosphoric acid,	0.003
Sulphuric acid,	trace.
Chlorine,	trace.

It has a fine drab colored inorganic matter, with a due proportion of oxide of iron and alumina. The proportion of the alkalies and phosphoric acid appear to be small; and yet, the growth of timber indicates a high grade of fertility.

A mechanical separation of the essential parts of this specimen of soil gave:

Very fine soil, or sand,	50.00
Coarser soil or sand,	20.50
Organic matter,	26.00

It had been exposed to the air several weeks, and had become dry, but soils of this description still retain from six to eight per cent. of water. Mixed with the organic matter we found small pieces of decayed wood, bark, roots, &c. The earthy part was invisible, an important fact, for we may always regard such specimens as containing it in a very fine state of division, and favorable for crops.

No. 2 was taken from an unreclaimed part of the marsh. The depth of soil is two feet. Subsoil contains sufficient clay to check materially the percolation of water, and resists the introduction of the spade. The consequence of this impervious state is, that the surface has always been wet, and more so than in No. 1. The

vegetable growth consists of reeds, which stand very thick. The pines are small and sickly, and intermixed with the former are gall berries and red and white bay bushes. The soil is supposed to have been burnt over in former times, as large stumps of charred pine still remain. After heavy rains the surface is nearly covered with water. It is, however, susceptible of drainage. On submitting this soil to analysis it gave :

Silex,	74.600
Organic matter,	18.000
Peroxide of iron and alumina,	3.000
Phosphoric acid,	0.021
Carbonate of lime,	0.049
Magnesia,	0.005
Potash,	0.040
Soda,	0.030
Water,	4.000
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	100.000

This specimen was nearly dry before it was weighed. It preserved its water a long time, and after several months exposure to the air, in an open box, it contained 15 per cent. of water. It contained rather fresh and half charred roots, with bark and wood, but its texture was compact, not spongy.

The separation of its parts mechanically gave :

Very fine sand,	55.545
Fine sand,	15.000
Organic matter,	18.000

No. 3 has been cleared for ten years, and has been regarded as second rate swamp land. The growth of laurels is greater, and fewer poplars and gums than No. 1. For ten years in succession it has been cultivated in corn, and produced, in its prime state, forty bushels to the acre. The last crop was only thirty. A crop of oats followed, with a yield of twenty bushels to the acre. The soil will average 18 inches in depth. The specimen for analysis was taken from a part of the field which is regarded as the poorest, or from that part of the field which produced the poorest oats. It gave :

Silex,	81.600
Vegetable matter,	12.800
Peroxide of iron and alumina,	4.100
Carbonate of lime,	0.020
Magnesia,	0.010
Phosphoric acid,	trace.
Potash,	trace.
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	98.530

The color of this soil is of a dark gray, and had become dry in the box beside No. 2, which remained wet. It is light and pulverulent, though it forms loose concretions in drying.

The quantity of silex is quite large for this class of soils, and some of the most important elements of growth exist in small proportions. There is quite a contrast between this specimen and No. 1, or between it and the best Hyde county soils.

The foregoing sample of soil is one which would be greatly improved by the use of marl. It has a large stock of organic matter, and hence large dressings, if thought advisable, could be used without injury. The labor and expense of enriching soils of this description is much less than when they are nearly destitute of soil or inorganic matter, and it is no doubt true that all the peaty soils which begin to be deficient in the inorganic elements may be brought up to the best class of soils by the use of marl alone, for in the use of this fertilizer more than one good result is secured. In the first place the necessary elements, lime, magnesia, iron and phosphoric acid are added to it, and in the second place marl consolidates the mass, an improvement which most swamp lands require.

No. 4 has a depth of 3 feet and rests on a sandy clay, and allows the percolation of water. The timber is very large, black gums from one to two feet in diameter at the stump, and fifty to sixty to the limbs, with straight bodies; the limbs form an angle of about 30° to the axis of the trunk. Poplars with large trunks are not uncommon, mixed with maples in keeping with the former as to size and thriftiness, and cypresses, averaging from 8 to 10 to the acre and from two and a half to four feet and a half in diameter at the stump; the bodies are straight, and the limbs form an angle with the trunk of 40° , and first appear at the height of one hundred feet. This tract is uncultivated. Its soil is composed of:

Silex,	77.56
Organic matter,	15.400
Peroxide of iron and alumina,	6.900
Lime, .....	.500
Magnesia, .....	.100
Potash,019
Soda,029
Phosphoric acid,062
Sulphuric acid,180
Chlorine,	trace.
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	101.028

The mechanical separation of its parts gave :

Very fine sand,	60.00
Fine soil,	25.50
Organic matter,	15.40

The sand is not coarse, but rather fine, and (quartzose) of a gray color. It is very uniform in size in all the specimens.

This tract probably contains the best land of the section. It is black in color and contains partially decayed roots, bark and wood.

The timber, depth of soil and its composition, indicate a soil probably equal in fertility to any in the eastern counties. The silicious matter is fine, and of a drab color. Portions of this soil, after drying in the air, were exposed to the heat of an oven having a temperature of 300° , and lost 34 per cent. of water.

It appears to be established from many observations and experiments relative to the swamp lands, that much depends upon the fineness of the soil intermixed with the vegetable matter; for when there is a perceptible coarseness of all the particles, the land will not bear cultivation many years. It will be deficient in elements which are always large enough in uplands, as the oxides of iron and alumina. The soil too, will be found to consist of quartz or flint, similar to that of beach sand. This variety dries readily, and is liable to become chaffy, or if the vegetable matter is fine, the quartz soon shows through the white ground in which it is imbedded; where, on the contrary, the earthy matter is fine, it retains moisture and bears the drouths of summer without suffering. In certain combinations of soil elements, extreme fineness

may be a defect; it may be too impervious to the air, and so light as to be blown away with high winds. Such cases belong to that class of soils where the vegetable matter is comparatively small. But in swamp soils extreme fineness, instead of being an objection, is an advantage.

§ 34. The high esteem in which swamp lands begin to be held should not blind the eyes of their admirers to the fact, that like other lands, they will show the effects of bad treatment after a while; and it may, indeed, does turn out, that they become at least partially exhausted after several years of cultivation. When it is found that the quantity of Indian corn per acre is steadily falling off, while the seasons are favorable, it is a warning to the planter that he is taxing his land too much, and it requires rest, or some modification of treatment.

Experience proves that guano acts admirably upon these lands when they are becoming exhausted, and no doubt the vegetable matter still remaining has much to do with the beneficial effects of this fertilizer.

Marl also acts very favorably, and it is one of those kind adjustments which brings these lands and marl in juxtaposition.

The favorable action of guano must in part depend upon the ready absorption of its ammonia by the vegetable matter, a fact which is well established. There is, therefore, less loss or less liability of losing this important element when used upon these lands, than upon uplands, where the vegetable matter is generally small, rarely exceeding five or six per cent., and often reduced to two or three.

We see, on comparing swamp lands with sandy ones in this respect, especially those of the kind which often occur in the eastern counties that, in the latter, the use of guano is rather precarious, much depending upon seasonable rains or showers. On swamp lands, again, neither guano nor marl are liable to burn the crop.

When, therefore, lands which have a constitution similar to those of Beaufort, Washington and others, it seems to be conceded that they are less liable to suffer from the irregularities of our climate than the best class of uplands.

§ 35. That part of the Albemarle and Pamlico swamp which extends into Tyrrell county, appears to rank only as second rate soil; but it is only upon the Croatan sound that we have made

examinations, and hence we may have formed an erroneous opinion of a part of this great tract. We know that there are lands of this class which are cultivated successfully and with profit, but how they rank, when compared with Hyde, Washington and Beaufort counties, our data are insufficient for forming a satisfactory opinion.

§ 36. The centre of this great tract is higher than the margins, and we believe this phenomenon to be due to a growth of vegetable matter, and it will probably turn out that at the surface there will be a deficiency of soil, or a great excess of the vegetable element. If this conjecture is true it will be liable to take fire from the carelessness of hunters, and even to occur when the common precautions have been taken to prevent it. Much, however, is to be expected from a better drainage than has yet been obtained. When this has been obtained there will be a great change in the upper part or surface, the loose vegetable matter will shrink to half of its present bulk, and if in the early times of the formation soil accumulated with the vegetable growth the surface may undergo so great a change by depression that the roots of crops may be brought within striking distance of the soil below.

CHAPTER X.

Bay river District, composition of its soil. The 4th District of swamp lands. The open prairie of Carteret County, composition of its soils, change effected by drainage. Inorganic matter increases with the depth of soil.

§ 37. Bay river district of swamp lands is included between the lower reaches of Pamlico and Neuse rivers, or between their forks as they unite to form Pamlico sound. Bay river is intermediate between these two rivers.

This district is much smaller than the preceding or the Albemarle. It has the same general characteristics; a flat country, with swamps interrupted by hard ground, which generally extends along, and not far from the estuaries of the Pamlico and Neuse.

The only specimen of the Bay river lands, which we have preserved for analysis, cannot be distinguished from those of the other districts. It is separated mechanically into the three distinct parts, and furnishes proportions, or ratios, quite similar to the best swamp lands; thus:

One hundred grains gave, of coarsish sand,	23.0	parts.
Very fine sand,	17.0	"
Organic matter,	55.0	"
Water,	5.0	"

§ 38. The partly chemical and partly mechanical analysis, gives a result corresponding to those of the other districts which are known to hold a high rank.

The principal point which requires to be brought out and proved is, the proportion of soil existing in the mass of the peaty matter, inasmuch as when this is proved, it has been found to possess the same complexity of composition as any soil from the midland counties; that is, it is found to contain iron, alumina, lime, magnesia, potash, etc., though like much of the soil of the eastern counties, the relative proportion of silex may be greater. It seems from this fact, and the character of the deposits in all the eastern counties, that formerly, the state of the river currents and other agents, performed the same functions that they now do, and much in the same manner; they transported the abraded materials from the upper country, assorted them, and disposed of them as the same rivers, currents, agents, &c., now do upon our coast.

§ 39. The 4th district of swamp lands, lying between the lower reaches of the Nense and Core sound, is elongated westwardly and comparatively narrow for its length. It furnishes the same varieties of soil as the preceding, passing from those which rank as number one, to number three, or those which are too poor to hold out inducements to clear them, in the present relative value of landed property. Indeed this country furnishes such a vast acreage of tillable land that even second rate lands will remain uncultivated except when their locations for market are extremely favorable. We ought to take their adaptations into consideration; for certain lands which rank only as second or third rate for corn, or wheat, may pay very large profits if planted with Irish potatoes. Certain

tracts of poor lands answer well for pasturage, sheep husbandry, etc. It is rare indeed, that we can justly say of this or that piece of land, that it is good for nothing. These remarks are applicable to the tract which we propose now to consider. We shall confine our remarks to that part of this district which is included in Carteret county. We have not attempted to give exact boundaries of swamp lands. It would be impossible in the present condition of the State surveys. When large districts are marked upon any of the best maps, it would be adopting an error to regard their boundaries as correctly drawn. The swamps are connected by strips of narrow belts, and swell out irregularly, and hence, may be considered as forming one tract, but their shape or form is extremely irregular, and most plantations have their swampy parts, though they are principally upland.

§ 40. It is a matter of little consequence, however, whether a tract of this class is large or small; the general characteristics will be those of the large areas; their composition will agree, and their qualities will belong to one standard, or, they will rank in the same grade according to the amount of inorganic matter which they contain.

§ 41. The great tract in Carteret, generally known as the open prairie, is a marsh or swamp, mostly destitute of trees; and hence, the area which is exposed to view is more than ten miles in length and breadth. But the entire tract, has an area more than two hundred square miles. In this tract, there is a continuity of swamp, ranging somewhat in condition, depth of mud, and solidity of surface, but it is all swamp in reality. It furnishes a growth of coarse grasses over its whole surface, or that part which is open to the sun. This tract is surrounded by a piney ridge which has a sandy soil and bears moderately large, long leaved pines. But the immediate border is so thickly overgrown with briers, reeds, bamboos, and other ugly bushes, that it is at the expense of a man's coat, pantaloons and shirt, if he forces his way through them. This outside hedge is twenty rods wide in many places, and even wider in others. Since improvements, however, on a small scale have been undertaken by means of ditching, the access to the open grounds is easy and safe.

This tract should be described under two divisions, the outside briery border, and the grassy open part. The first is much the

least in area, but it is of considerable importance, as it is land which has a high intrinsic worth.

We visited this tract in 1852, in April, by the direction of the Board of Education. The time proved very unfavorable for conducting the examination. The prairie was filled with water and the facilities for getting over it, were only clumps of grassy knowles which stood above the water. It was soft and yielding to the foot every where else, and was easily penetrated to a depth of between five to ten feet.

During this visit, we procured specimens of the surface from a depth of eighteen inches. When brought up, they were spongy and black, and consisted mostly of vegetable fibre, undergoing the common changes incident to swamp grounds. But the examination was not satisfactory, and could not be from the circumstances under which it was made. The question, however, for decision was, whether the composition of the soil of the swamp held out encouragements for expenditure for draining it, or if drained, could it be cultivated with profit? The surveys of this great tract prove that it may be laid dry; it is from 12 to 15 feet above storm tide.

The drainage is into Core sound and Neuse river, and is higher in the middle than its borders. The largest or heaviest drainage is into the Neuse. The position of the open ground prairie with respect to water access and removal of products is very favorable, and if this tract was under cultivation, all parts of it would find convenient points for reaching the deep waters of this river.

The soil of the rim of the open prairie is richly constituted. On submitting a sample to analysis it gave:

Water,	11.200
Organic matter,	52.700
Silex,	32.500
• Per oxide of iron and alumina,	2.000
Carbonate of lime,	1.000
Magnesia, .....	.300
Potash, .....	.073
Soda,	
Chlorine,	trace.
Sulp. acid,	trace.

100.063

§ 42. This part of the tract furnishes a black vegetable mass from three to five feet deep; it is homogeneous and contains comparatively few fibres in an undecomposed state. By experiment it produced excellent Irish potatoes, and a growth of corn stalks and leaves, which, in consequence of late planting and inattention, bore no ears. The seed was planted the 20th of June, and the weeds were allowed to have their way, but the result proved that the crop did not fail in consequence of the unfavorable constitution of the soil. When corn is planted in peat destitute of soil it grows to the height of a foot and then dies. The stalks, however, were well developed and well supplied with leaves, and grew to the height of 10 feet. Hence, it is probable that had the corn been planted in season and properly hoed it would have borne fruit. However, there never has been much doubt respecting the border soil, its rank vegetation furnishes testimony quite conclusive.

Mechanical separation gave:

Coarsish soil,	7.00
Fine soil,	25.50
Organic matter,	52.70

It, therefore, contains a large per centage of very fine soil, and which is well adapted to the growth of crops.

§ 43. The piney ridge which forms a border still higher than the prairie has a soil more sandy than the preceding, and is regarded a second rate land of this class. It gave, on analysis:

Water,	2.58
Organic matter,	8.58
Silex, mostly sand,	78.20
Per oxide of iron and alumina,	3.82
Carb. of lime,	3.80
Magnesia,50
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	99.58

Separated mechanically it gave:

Coarsish sand,	17.20
Fine soil,	16.00

§ 44. The foregoing furnishes nothing important any farther than the fact that the immediate surroundings of the prairie the soil differs in no respect from the common soils of this region of country. A change, however, is immediately recognised on passing within the piney ridge, especially that of the open grounds.

Since an important drainage has been effected by a ditch about four feet deep, and extending one mile from the outer rim, the ground has settled about 18 inches over an area of about half a square mile. It was near the drained part that our soils were taken in 1852. Upon this part, or the drained part, three small patches of corn were planted last year. The two outer pieces were upon the part from which our first specimen of soil was taken, and in the same piece with the corn, beans, and Irish potatoes were grown which ripened well. The piece of corn upon the open prairie and about three-quarters of a mile from the outer rim was not equal in size and vigor to that nearer the outside; still, considering all the circumstances, the experiment ought to be regarded as successful, though we do not believe this tract adapted to the growth of corn.

From this patch, and from the bottom of the most vigorous corn hill, we took a specimen of soil for examination. It had the following composition:

Water,	21.38
Organic matter,	60.62
Inorganic matter,	2.60

It can hardly be maintained that so small a quantity of inorganic matter would have sufficed for the existence of corn of the size we found it in September, and the only solution which can be given of the fact is that the roots penetrated to the subsoil which contains a much larger per centage of inorganic matter.

This view is sustained by the character of the soil which appears in the middle of the ditch not more than 10 feet from the place where the corn grew, and about 12 to 14 inches deeper than the specimen just referred to.

Thus the soil of the middle of the ditch, under the vegetable coating, gave on analysis:

Water,	12.08
Organic matter,	46.22
Silex,	34.58
Peroxide of iron and alumina,	2.60
Carb. of lime,	2.60
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	91.66

The mechanical separation of parts gave:

Coarse sand,	27.00
Fine soil,	11.58
Organic matter,	46.22
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	82.80

§ 45. Not far removed then from the surface soil there is a deposit consisting of organic and inorganic matter in due proportions, and within the reach of the roots of corn and other plants. The soil being light presents no obstacle to their penetration below, and indeed are invited there by a greater amount of moisture since the drainage began. The sand in the middle part of the ditch and elsewhere probably, is distributed irregularly. We find it as it were in nests, but there is still in the vegetable part a fine soil to the amount we have stated. We were unable to procure soil in 1852 from this depth, though in sounding we always found what appeared to be a sandy deposit. Since the surface has settled by drainage, the upper part has as it were diminished greatly in thickness and seemingly in quantity, but it is really only in bulk. It has become compact. The coarse sand is of a granitic origin, as it contains felspar and mica, a fact which holds out an improved prospect of its fertility being lasting.

We would not advise an attempt of raising corn upon the prairie grounds. We believe the Irish potatoe will prove the most profitable crop, especially so long as they find a ready sale at the price of from \$1.50 to \$2.00 per bushel. Irish potatoes can be raised at a cost of only ten cents per bushel, at which price they become profitable for the manufacture of starch. But so long as they bear so high a price, starch making, though a simple process, would be out of the question. The quality of the potatoe grown upon the prairie is really superior to the northern growth, or to such varie-

ties as find their way to this State, being mealy and entirely free from a strong taste or odor. They would also be employed if cheaper for fattening swine, as they make a superior meat when the fattening is completed by the use of corn meal.

The composition of the soil at the bottom of the ditch differs essentially from the foregoing. It contains :

Water,	4.80
Organic matter,	6.60
Silex,	79.82
Alumina,	2.92
Peroxide of iron,	1.30
Carbonate of lime,	3.00
Magnesia,40
Potash,03
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	98.87

§ 46. A result similar to that which is brought out strongly in this analysis seems to be one, which is general, or common to all soils of this class. It is the steady increase of soil in quantity, proportionate to the depth. At the top, it is at its minimum; in the stratum from one foot to twenty inches below, it has sensibly increased; and near the bottom, it is in quantity equal in amount to the upland soils, though more silicious. There the top of the soil has only between 2 and 3 per cent. of soil; it is really the ash of the vegetable matter. Eighteen inches deeper, and we find 34 per cent., and at the depth of 4 feet, it has increased to 79 per cent. Considering the character of the soil, we regard these facts as important, for there is really no obstacle to the penetration of roots to this depth when the body of soil is drained. We often find roots penetrating still deeper, and in a stiffer medium by far than this. It is essential, however, that stagnant water should be removed, and that no layers of earth and vegetable matter containing astringent salts be left undrained; and if existing should be neutralized by the use of lime or marl. We may also observe that the organic matter continues to the depth of four feet, but it diminishes about in the same ratio that the inorganic increases, but its presence is important, as it keeps the mass porous, and if air penetrates thus far it is acted upon and furnishes the usual products for the growth of a crop.

But in the middle of the large swamps, the vegetable covering is much thicker than upon the borders, and hence may be, and no doubt is, too thick to permit the roots to reach a bottom, or layer charged with soil. How much deep draining will effect in consolidating the surface after a sufficient lapse of time for drying and increasing its solidity, has not yet been determined by trial. We have found in some samples 100 per cent. of water remaining after the soil had been exposed two weeks to the air. While vegetable matter is thus soaked, or permeated with water, its bulk is greatly swollen; and hence, when removed by thorough draining, and it will also shrink excessively and probably not occupy more than one third of its former bulk; its diminution of bulk, will no doubt in many cases render the soil accessible to the roots of plants.

In the Albemarle district and adjoining the tract, and indeed forming a part of it, there is an open prairie quite similar to the Carteret in general appearance. It lies towards Pungo lake, or a little to south-east of the creek. It is called the burnt lands from the common opinion of the inhabitants, that it has been burnt over, when its timber was destroyed. It is regarded also as having been prior to this period a juniper swamp. At present its vegetable productions are limited to a few scattering bushes which do not interfere with a wide view over the whole field for many miles in all directions. To the eye the surface soil scarcely differs from that of adjoining productive tracts. But the prevalent opinion is that it will prove a barren field after a few inferior crops are harvested.

We have only separated the parts of the soil taken from near the surface. It is black and slightly gritty between the teeth, and evidently consists of vegetable matter to a great extent.

On being mechanically divided, it gave :

Coarsish quartzose sand,	1.70
Fine, or very fine soil,	4.10
Vegetable matter,	27.2
Water,	67.0
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	99.030

This separation gives a small per centage only of soil, but as the specimen was fresh from the field, and contained a large propor-

tion of water. The 67 per cent. which it holds before draining, will afterwards be diminished about two-thirds; and hence, the quantity of fine soil will be relatively increased. We should also take into the account the increase of soil in depth, and within striking distance of the roots of crops, which will come in aid of the planter. Without spending time in a conjecture whether the burnt district can be profitably cultivated, as it is, it will aid us in making up a judgment before hand to compared it with another on its growth of timber in its vicinity, and whose soil is externally identical in character. It is a tract situated near or upon McRae's canal. This tract is remarkably heavily timbered. The trees consist of black and white gum, cypress, the long and short leaved pine here and there, and all are large. Among them is the red maple, which is regarded as a sure indication of a productive soil, when associated with the foregoing.

The composition of this soil, as determined mechanically is as follows:

Coarsish quartzose sand,	3.50
Fine soil,	5.00
Water,	70.80
Organic matter,	20.70
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	100.00

It appears that a soil of the foregoing composition with only 8.50 per cent. of inorganic matter bears large forest trees and those which all regard as indicative of a productive soil; and indeed, which has proved to be such when brought into cultivation. The differences then between the two soils, the burnt lands, and the canal tract, are only slight; and it appears to us, that an attempt to cultivate the former is warranted by all the facts which have come to our knowledge. The differences do not seem to be so wide, at any rate, that one should be set down as barren and worthless, while the other, is regarded by all as an exceedingly valuable tract.

The same remarks apply to the open prairie of Carteret, though not so forcibly, yet we have sufficient indication that it will be productive of a number of crops when it is properly drained and attended to.

CHAPTER XI.

Composition of soils towards Beaufort. Composition of Mr. Sefton's swamp land. Adams creek soils, Craven county. Dover swamp Craven county. Its hight above Newbern. Composition of its soil.

§ 47. The open prairie is at present a wilderness, but towards Beaufort many plantations are located upon the main road leading to these lands, and which include portions of it which are regarded as highly valuable. Several tracts, from four to six miles from Beaufort, have been examined.

Of these, Mr. Sefton's furnishes probably as fair a representation of the character of this part of the Carteret swamp, as any. The timber is all large and thrifty, consisting of cypress and black and white gum, mainly, with water oak and the long and short leaved pines. The part from which the sample of soil was taken has been in tillage two years, and had at the time a crop of corn unharvested, which from estimation by the owner, would give fifty bushels to the acre. It is black, but shows sand within one foot of the surface. The specimen taken was from a depth of eight inches, and from the corn field alluded to. It gave, on analysis:

Water and organic matter,	20.000
Silex,	73.300
Peroxide of iron and alumina,	4.400
Carbonate of lime,	1.700
Magnesia,170
Potash,086
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	99.656

The sample had become dry by exposure to the air for three months. It contained a trace of ammonia in 1,000 grains. Upon a part of this tract which had been in cultivation for several years, fine looking cotton was growing. It was late planted, but the trial was regarded as highly successful, and it will probably turn out that the best soil for cotton are those of the half worn ones which originally were rich in vegetable matter. On such lands there would be a great saving in fertilizers. Mechanical separation of its parts, gave:

Coarsish sand,	43.2
Fine soil,	30.0

The coarsish sand is all quartz, and it is visible in the dry specimen, and is easily detected in the wet, by its gritty feel. Still, there is a stock of fine matter sufficient for all the wants of vegetables. The vegetable matter, as usual, increases in depth towards the central part of the swamp, and the growth of cypress and black gums is also greater in this direction than upon the margin.

§ 48. Immediately opposite to the section of land which has been drained, and the soils of which have been under consideration, is Adams creek, in Craven county. The principal branches of Adams creek rise in the crowning part of the open prairie, and if prolonged would interlock with the branches which form the North river on the Beaufort side. We have the soils at this time from the banks of Adams creek, and have made several analyses of them to that extent which will serve as a basis on which we may found a judgment of their merits.

We did not deem it necessary to make a minute analysis as in other soils, and it seemed sufficient to do enough to enable us to make a comparison of their qualities with those of the North river as well as those from other swamp lands. The first is evidently a mixture of organic matter with fine and coarse sand and other elements brought out by analysis. It gave:

Organic matter,	29.00
Silex,	54.80
Alumina and iron,	4.40
Carbonate of lime,	0.35
Magnesia,	0.13
Water,	11.00
	—
	99.68

A mechanical separation gave:

Rather coarsish sand,	43.00
Fine soil or sand,	28.40
Organic matter,	29.00

This soil had become dry by exposure to the air, and much less

water was obtained than is usual from swamp soils, and where there is as much inorganic matter as in this specimen, the drying by common exposure is more complete and rapid than where it has less. The sand is white quartz. It appears that the sand of the open prairie of Beaufort is coarser than that of the Albemarle district, but it is intermixed with a quantity, 16 per cent. of fine material.

Another soil from Adams Creek differs from the foregoing, as will be seen in the larger quantity of sand and less vegetable matter. It is gray and gritty, and harsh to the feel, and was taken from beneath the covering of organic matter. On submitting it to analysis, it gave :

Water,	6.30
Organic matter,	8.00
Silex,	82.58
Peroxide of iron and alumina,	2.82
Carbonate of lime,50
Magnesia,13
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	100.03

We have been able to obtain a small amount of potash in all the soils we have examined from the swamp lands. It is diminished to a small fraction wherever the sandy element is so large. A mechanical separation of its parts gave :

Coarse sand,	56.2
Fine soil or sand,	29.0
Organic matter,	8.0
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	93.2

In another specimen, the organic matter was only 3.22, water 6, silex 88.78, alumina and peroxide of iron 2.60.

The Adams creek district seems not to want inorganic matter at all; they have, indeed, rather an excess, and too little vegetable matter. To account for this fact, it seems that the Craven side of the great marsh must have been nearer to the source from whence the sandy matter was derived, and though none of it is what would not ordinarily be regarded as coarse sand, yet it is coarser than

that of North river. There may have been a direct communication with the Neuse in former times, and by means of that communication the sandy matter was supplied. The coarse is always nearer the source from where it came. The fine is transported farther and is deposited slowly; facts which may be witnessed in all heavy showers where currents are formed with sufficient force to move the loose materials upon the surface.

§ 49. The Dover swamp, lying north of Newbern, in Craven county, is about fifteen miles long. It is about 60 feet above Newbern, and 30 or 35 above Kinston.

So far as its character is shown by the roads which pass through it, it is a poor tract.

A single representative only of its soil will be given in the following analysis. The soil is black, and to the eye it may be regarded as ranking high in the scale of merit, but where the black vegetable mold is cut, and has been exposed to washing by rains, they have brought out mechanically its characteristics. The vegetable matter is mixed with a white marine sand, which is exposed upon the face of the cut; an exhibition of this kind is never witnessed in soils suitable for cultivation. An analysis of a soil representing the Dover class, gave:

Water,	2.71
Organic matter,	25.22
Sand,	70.50
Peroxide of iron and alumina,	0.76
Carbonate of lime,	0.01
Magnesia,	trace.
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	99.20

The specimen had become dry by exposure to the air in paper, and hence, the small quantity of water. The sand is white, and nearly pure quartz, and only a small per centage could be dissolved out by the action of muriatic acid. When this specimen is compared with those of the Albemarle swamp, which seemed to lack inorganic matter, a great difference is easily discovered in the Dover swamp representative; the water was reduced to the lowest standard; it was much drier than it ever will be by draining. In the Dover representative there are really only two elements, white

sand and vegetable matter. If water is added, the sum of the three amounts to 98.43, leaving only 1.57 for the active or soluble elements, and still the Dover swamp is covered with vegetation, though it is not vigorous and healthy. It is no doubt, supported in a great measure, by the subsoil and the elements derived from the atmosphere.

If a farmer, however, should drain and put it requisition for corn or wheat, it would not answer to the call. It is not to be understood that we speak thus confidently of the whole tract, and it is highly probable that rich places exist. The most we wish to inculcate is that where the soil consists of vegetable matter intermixed with white or gray quartz sand, there is but a small ground for hope that the tract will pay the expense of drainage. The foregoing views as intimated in the foregoing paragraphs receive support from the consideration that .76 per cent. of per oxide of iron and alumina cannot furnish for a lapse of years sufficient phosphoric acid to sustain the cereals, it is at least evident, that the available matter for divers crops is extremely small. The practical per centage of important elements, cannot exert a chemical or mechanical influence upon the organic matter.

We confess, however, that we do not know the nature of the subsoil, it will probably turn out that the forest trees derive their support from the stiff subsoil on which the silicious vegetable matter rests. There are many points in which the swamp soils differ from the true peat of the Northern States and Canada. A very reliable analysis of a kind of peat found in Canada by Mr. Hunt of the Canada Geological survey may be cited. Thus, Mr. Hunt found 6.75 per cent. of ash, and it should be observed that it is not soil, as in most cases of the swamp peat of the South but a true ash of the vegetable matter, and hence, its composition must partake of that of an ordinary ash; and hence, it is found to consist of large per cents., viz: of carb. of lime 52.41; sulphate of lime 15; sulphate of potash 0.60; lime and magnesia as silicates, &c., to the amount of 13 per cent. The peaty soils of the South, or certainly of North-Carolina consist of intermixtures of fine inorganic matter to a large extent, and though the top is essentially vegetable matter, yet the soil increases continually, or if the areas as indicated before had communications with rivers from which they received sediments, whereas, in the North the peat is formed in isolated basin-shaped

excavations, which have been filled up by the growth of moss, or sphagnum, etc., and were of course separated from rivers or streams bearing sediments from a distance.

§ 50. The Onslow and Jones swamp, which appear to be connected with the great Carteret open-ground prairie and swamp, has an area of over one hundred square miles. The White Oak river rises in it, together with New river, both of which empty into Bogue sound, or Bogue and Stumpy sounds. Short branches rising in this tract, fall into the Trent. The slope is mainly towards Bogue sound. This great tract is easily drained, being formed upon comparatively high ground. Portions of it have been under cultivation, and the produce in corn has been from ten to twelve barrels per acre. Upon the branches of the White Oak the timber is large, consisting of poplar, cypress, black and white gum and red maple. Other parts are covered with reeds which furnish subsistence to stock during the winter. The surface of the swamp is more or less interrupted by dry islands, which bear large long and short leaved pines. White oaks abound of a large size, where it is not too wet. Some of the islands, as they are called, have a light sandy soil, and seem to have been formed by the action of water. The only canal for drainage which we have inspected, was cut by Mr. Franck, of Onslow county. It crossed a part of the tract called the White Oak desert. This, on being cut one mile, gave a water power of about twelve feet. Its cost was fifteen cents to the cubic yard. The depth of soil varies from one to twelve feet, the depth increasing towards the central part of the tract.

The general characteristics of this swamp are the same as those which have already received attention. The composition, as determined by analysis, may be stated as follows:

Silex,	60.00
Organic matter,	25.00
Peroxide of iron and alumina,	11.050
Phosphoric acid,	0.312
Carbonate of lime,	1.500
Magnesia,	0.300
Potash,	0.010
Soda,	0.020
Silicic acid,	0.100

Water,	2.713
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	100.983

The machanical separation of parts gave:

Coarsish felspathic sand,	27.00
Drab-colored fine soil, or sand,	45.00
Vegetable matter,	25.00

The soil was dry by exposure in paper, and to the air.

The felspathic sand is coarser than that of any part of the Albemarle district. The quantity of fine soil, and of lime also, is large, and the elements of fertility appear to be sufficient to constitute a good composition for cultivation.

CHAPTER XII.

Swamp lands of New Hanover and Brunswick counties, their composition with remarks.

§ 51. The fifth swamp district is in New Hanover county. It is formed by the Holy Shelter swamp and Angola bay. They both are elongated tracts, and drain into the eastern branch of the Cape Fear.

We find the composition of the soils of the swamp lands of New Hanover county to correspond with those already given. Thus a specimen gave, on analysis:

Organic matter,	7.500
Silex,	86.000
Per oxide of iron,	1.000
Alumina,	4.000
Silicic acid, .....	.300
Chlorine,	trace.
Sulphuric acid,	trace.

Potash,077
Carb. of lime,320
Magnesia,105
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	99.502

Mechanically separated it gave, in parts:

Felspathic sand,	32.0
Finely divided soil,	49.0
Organic matter,	7.7

The specimen was well dried before analysis, and was black, but consisted of vegetable matter in small quantity only, and in which the soil was distinguishable. Still it has been proven productive.

§ 52. A fact which will perhaps strike the attention of a chemist is the small quantity of iron which exists in all the swamp soils. It is not only, as we have before stated, in the condition of a protoxide, but it is in a less proportion than in upland soils. How much influence this quantity of iron may have upon vegetation, to diminish the chances of a healthy growth, cannot be determined before hand. Iron is no doubt an important element in soils, though we believe, upon the whole, that even in the swamp soils it will be amply sufficient to meet the wants of crops.

So long as these tracts are undrained, charged with water, the iron will remain in the condition of a protoxide. When drained, and air replaces the water, it is at least partially changed, and becomes more highly oxidated and is constantly undergoing changes by which the amount of oxygen is variable, especially when in contact with a large amount of vegetable matter.

§ 53. The sixth swamp district is confined to Brunswick county. It is round or nearly so, and presents a very uniform outline, but its interior is studded with islands, and the swampy part incloses them entirely or they are connected to others by narrow necks of hard ground. This swamp lies low and its perfect drainage is questionable. We have not been able to obtain an examination of surveys which were made years ago. It furnishes a vast amount of cypress for shingles. The timber is well set, large and thrifty, and

the indications for fertility are the same as those which have been already stated.

The composition of the soil supports the views just expressed. A sample on analysis gave :

Organic matter,	37.50
Water,	15.80
Silex,	35.35
Peroxide of iron, and alumina.....	10.50
Carb. of lime,	1.45
Magnesia,	0.15
Potash,	1.10
Soda,	0.15
Sulphuric acid,	trace.
Chlorine,	trace.
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	100.00

A mechanical separation of its parts gave :

Coarse sand,	2.10
Fine soil,	33.25
Organic matter,	37.50

It should be stated that this soil contained a greater quantity of half decayed wood sticks than usual, and hence, the proportion of soil is comparatively less than it would have been by rejecting this kind of vegetable matter.

§ 54. Large tracts of this swamp are laid under water by dams which overflows the high way or roads and the traveler is forced to drive his team through water from a foot to 4 or 5 feet deep. The tide of the Cape Fear sets up the creeks some twelve miles from their mouths, which is indicative of a flat country to within a short distance of their origin.

The subsoil is often too stiff for easy cultivation, or the penetration of roots. It approaches in composition and consistence a brick clay. Thus the silex amounts to 83 per cent. with 21 per cent. of organic matter, and with only traces of lime, magnesia and potash. It is probably as in other cases variable in composition.

Another specimen of the Brunswick and swamp soil furnished by Mr. H. J. McNeil, gave :

Water,	8.000
Organic matter,	34.000
Silica,	45.470
Peroxide of iron and alumina,	10.490
Carb. of lime,	0.490
Magnesia,	0.490
Potash,	0.581
Soda,	0.326
Sulphuric acid,	trace.
Chlorine,	trace.
Silicic acid,	0.580
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	99.997

The composition of this sample indicates as high degree of fertility as the Hyde, Washington or Beaufort counties.

While analysis furnishes very satisfactory results, it is not to be forgotten that the tracts adjacent may be less so, and indeed, not productive at all. Where changes in the kind of timber are apparent, passing from the cypress, gums, poplars and maples, etc., to bays, gall-berry, especially if accompanied by a dwarfed condition, it is an indication that the soil has changed, or the conditions have passed from a favorable, to a less favorable one, and though the change may possibly be due to influences which deep draining may remove, yet, in a majority of cases, it is due to the constitution of the soil. This should be examined, and tested in the way we have proposed.

§ 55. In a few wet districts we sometimes meet a peculiar soil, which is, as the people say, salt; but which really never contains but a little chloride of sodium, or common salt. It is a black vegetable substance, in part charged with the astringent salts of iron and alumina. We are induced to speak of this product because we have seen it from three different parts of the eastern counties, in Weldon, near Tarboro' and at Mosely Hall, in Lenoir county. The specimens have the same characteristics, though that from near Weldon was obtained from a depth of 70 feet. We communicated with those interested at Weldon and Tarboro', and have not preserved a statement of results. The specimens from a swamp at Mosely Hall will require a brief notice; though they deserve a full analysis, yet time will not permit us now to enter into details.

The substances, which are really swamp products, are black, with an astringent ferruginous taste. If applied to crops, or if seed are planted in it, they are of course destroyed.

The black astringent substance contains, in 100 parts :

Water and vegetable matter,	11.70
Silex or sand,	82.30
Protoxide of iron,	1.52
Alumina,	1.82
Carb. lime,	0.80
Sulphuric acid,	1.61
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	99.45

The surface of this vegetable matter is crusted in dry weather with this astringent salt. If this substance were in great abundance it would be an excellent material for composts, notwithstanding it is now poisonous in composition. Mixing lime or marl with it will decompose the present salt and form gypsum. This substance too, is adapted to use in stables, or any place where ammonia is generated, and escapes into the air. Sulphate of ammonia will be formed, or even the vegetable matter itself as it is absorbative, will attract and retain ammonia, but indeed as it is with this salt, it is an admirable material to spread over the refuse of stables and yards where noxious odors escape and which are always we believe compounds, containing ammonia or sulphur or both.

From this swamp deposit we have obtained phosphate of iron, a product which we suppose may have been formed from decomposed animal matter; it is rare one and may be distinguished from other minerals by its beautiful blue color.

Another product of this swamp we are inclined to regard as a compound of phosphoric acid, lime, etc., but we are still in doubt respecting its true character. It is white, inclined to chrySTALLIZE in radiating forms, and is sometimes a white, soft substance, and in others quite a hard concretion, assuming a cylindrical form. It is intermixed with grains of quartz, which are foreign particles. It gave, on analysis:

Water,	4.2
Organic matter,	4.0
Silex, or insoluble matter,	59.0

A substance resembling alumina,	28.0
Carbonate of lime,	4.82
Magnesia,	0.10
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	99.92

The white substance resembling alumina, we suppose may be a compound with phosphoric acid, but we have not the proper tests to determine fully its composition; that it is not alumina, is proved by the fact, that though a part of it dissolves in water, yet the precipitate from the potash solution is fused at once in the flame of the blow pipe. If a phosphate exists in quantity, it is a valuable substance; if not in quantity, it is a very interesting one for the mineralogist. A test for alumina is the production of a blue bead with nitrate of cobalt in the flame of the blow pipe. There is a tinge of blue, when thus treated, but the blueness is not strictly that which is common to alumina. These several products were received from Mr. Parrott Mewborn, of Lenoir county, who obtained them in draining a swamp. The foregoing products are the most important, but another which is excessively sandy and brownish black, we have analyzed. It contains:

Silex,	91.0
Water,	2.1
Organic matter,	4.5
Peroxide of iron and alumina,	2.75
Carbonate of lime,	trace.
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	100.35

Compounds having the foregoing composition are worthless, and seem to have acquired the vegetable matter as a debris, and not from a growth of vegetables upon the spot.

CHAPTER XIII.

Gall berry lands, and their composition. The Savannah lands and their characteristics and composition.

§ 56. The gall berry lands, as they are called, are a species of swamp, but their characteristics cannot be subjected to the exact rule of the carpenter, nor the legal measure of the grocer; they refuse to be subjected to specific technicalities, though they have certain common characteristics. All lands are not *gall berry*, because the gall berry has taken possession; neither are gall berry lands all composed of stiff clay; some are sandy, with black vegetable matter concealing it, while uncultivated or unbroken. Gall berry lands are level tracts, composed of wet and sandy argillaceous matters, or wet sandy, with black vegetable mold intermixed, and with only small fractional parts of the money elements contained in them in either case.

They seem to have been formed by denudation, by the action of the waves of the sea, by which the best part of a soil, the top, has been carried away, as a stratum of stiff, incorrigible, sandy and ferruginous clay beneath. Over certain areas subsequent to denudation, sand has accumulated along with a coarse vegetable growth, as water grasses and the like; in fact, a formation went on accumulating like the best swamp lands, but the material was a quartz sand, containing only traces of the nutritive elements. In the other case, a formation, though slowly building up now, began with the process of filling up very recently, and the bottom clays exposed by denudation; still, from the top or surface the dwarfed vegetation springs from this incorrigible sandy clay, which is poorly mixed, coarse and closely compacted, so as to hold water about as well as a wash bowl. By evaporation in summer, and a slow leakage, these lands get dry by the middle of July or the first of August, and then they may be traversed, but they are liable to become wet by heavy showers, when by the same processes they again may become dry. In this condition of the soil and surface the inducements are not sufficiently weighty to tempt the owner to drain them, for the purpose of testing their qualities for crops of the cereals, or the less expensive products, the root crops, to

which they are not really adapted. Like other species of land, we find them variable in composition, but uniformly with a level surface, and so close that water stands upon them until it evaporates.

Their relative position is westward of the kinds of swamp which have been described; though lands answering to the gall berry occur in patches in all parts of the eastern counties with variable aspects, but always wet, level and with a dwarfed vegetation.

Their chemical constitution gives two extremes; the black, sandy vegetable mold, and the stiff, sandy, argillaceous bottoms. The former is often mistaken for good swamp soil; the latter, never. The vegetation is much the same in both; coarse water plants, a few reeds in favored places, particularly on the banks of streams, small, short and long leaved pines; but the whole aspect of the vegetation is that which arises from a short allowance of food, and exposure to cold bottoms beneath, and a chilly atmosphere above.

The silex in all the kinds of gall berry lands is large, the soluble alumina and iron, small—and the other elements in small fractional quantities.

Thus in a specimen from Sampson county, we found:

Water,	3.09
Silex,	88.40
Organic matter,	4.20
Peroxide of iron and alumina,	2.92
Carbonate of lime, .....	.02
Magnesia, .....	.01
Potash and soda,	trace.
Phosphoric acid not perceptible, .....	.00

But medium results are obtained by cultivation when these lands are well drained; but, as it costs as much for draining the lands as better ones, it is not often done. The specimen had become dry by exposure to the atmosphere.

A mechanical separation gave:

Coarse sand,	38.
Fine soil,	50.10
Organic matter,	4.20

§ 57. *The Savannah lands*, differ from the preceding in many important particulars. They are to the eye, dead level tracts, open to the sun and bordered by clumps of trees irregularly planted so as to have open spaces either leading to similar tracts or into the depths of a forest. They are now usually covered with broom grass, and appear rather barren in winter, but in the spring if the dead grass is burned, they become green and pleasant. We have no authentic history or tradition which can be believed in all respects, in regard to their origin. But they really are miniature representations of western prairies, and probably originated by the action of similar causes.

When a certain kind of soil has been forest planted, it continues in forest for centuries, unless some cause destroys the root and branch, as fire or water; and when destroyed and opened to the sun a thick coating of grass covers the ground so perfectly, that the seeds of forest trees are deprived of the necessary stimulants to germination, or if they germinate a repetition of destructive agents again occurs, till all seeds at or near the surface have germinated and have been destroyed. Grass ultimately gets full possession; and though in the general it appears only as grass, yet if watched carefully, it will be found that the grasses have been changing, or a natural rotation has taken place; the rule of exchange being a succession of grasses from the better to the worse, by which we have ultimately in this climate broom grass, an unmistakeable index of an exhausted soil. This view, however, is sustained only when the products of vegetation are taken away. Combustion of the surface materials, followed by winds which transport the light ash far from the field upon which the plant grew which produced it, is an exhausting process. Forest fields when once exposed to the sun by the destruction of their pines, oaks and hickories, are directly in the road to a prairie, or savannah formation; and when the latter is formed, it becomes as permanent as a forest. As it regards their origin, we incline to the theory, that fire has been the direct instruments concerned, and is still more or less active, in preserving these tracts in a stationary condition. The water theory, is less intelligible than the fire theory; the latter explains all the phenomena as we think better than the former.

The soil of the savannahs is fine, yellowish and compact, not unlike a brick clay, and so far as we have observed, contains by far

less coarse sand. It is a homogeneous soil, in which respect, it differs from the gall berry, and it being fine, compact, deep, and still wet, though not a swamp at all, it still holds always too much water for the cultivation of the cereals. The land is cold; a term undoubtedly applicable to this class, in which respect, it differs from the prairies of the west. It differs also from the swamp soils in the absence of vegetable matter, and from the uplands by compactness and firmness of material, and hence too the explanation of the fact, too cold and moist, for the cultivation of the cereals or even of root crops.

The specimen of soil which has been examined was taken from a savannah in Craven county, which is being put into a state for cultivation, and which is owned by Mr. Wood. The Atlantic railroad passes through it. These lands in Craven county, though not so extensive as those of New Hanover, still seem to possess the same characteristics. We cannot affirm that there are not many varieties of savannah lands, still, there are good grounds for believing that they possess a greater uniformity of composition than the swamp or gall berry lands.

The savannah soil of Craven, on being submitted to analysis, gave:

Water,	4.00
Humic acid or soluble organic matter,	2.00
Insoluble,	1.70
Phosphoric acid, undetermined,	
Silex,	80.590
Silicic acid, .....	.100
Alumina,	7.000
Peroxide of iron,	3.400
Carbonate of lime,600
Magnesia,176
Potash,098
Chlorine, a large,	trace.
Sulphuric acid,	trace.
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	99.664
Ammonia,0387 per cent.

The specimen was dried in the air previous to analysis, it therefore does not represent the quantity of water held by the soil in its ordinary condition.

The chemical constitution of the savannah lands appear to be well composed for durable cultivation. They will require deep draining and the time required for the escape of water will undoubtedly be twice as long as that necessary to drain ordinary up-land soil, in consequence of the fine state of division in which the materials exist, and their natural affinity for water. When drained and dried, we have reason to believe that they will become good wheat or cotton lands.

APPENDIX,

Containing brief descriptions of the mineral springs and well waters which occur in and about Raleigh.

§ 58. At numerous places in Wake and the adjacent counties several springs have been discovered which are entitled to the appellation of *mineral waters*. Frequent inquiries have been made by letter relative to them, and in several instances these waters have been sent to me for analysis. These requests have been complied with so far as it seemed to be necessary. In most cases, however, when the general character of the water was known by taste, or by its behavior on standing twenty-four hours, I have merely made a qualitative examination. The water in this neighborhood, or in the town of Raleigh, are all chalybeates, and though they appear to be weak, or contain a small amount only of mineral matter, yet it is sufficient for medical purposes; for if the quantity was larger, it would be more disagreeable to the palate, less would be drank, and it would both affect the head and produce a feeling of tightness across the chest. The quantity of mineral matter is therefore well adapted for use in all cases where chalybeates are useful. An essential condition for the salutary influence of chalybeates is, their solution in a large amount of liquid matter. It insures their absorption into the system, and thereby favors their specific influences, much more than if they were in a concentrated state.

The well waters of Raleigh, which are used for drinking and cooking rank with as much propriety in the class *mineral waters*, as the springs referred to. They differ, however, from them in the absence of iron, or if it exists, it is but a *trace*, and in the presence of chlorides, which exist only in traces in the mineral spring waters. How much influence impure well waters have upon the health of a community is not well determined. But it is well known that to strangers the common waters of a locality are frequently highly injurious, and it is probably true that the purer the water for common use, especially for drinking the better it is, and there is very little doubt that the best water which can be procured for family use, is *rain water*, collected and preserved in filtering

cisterns. In summer it would be warm, but cooled with ice it becomes a luxury.

There is a great uniformity in the composition of the spring waters of this description; the constant differences being a variation in the amount of solid matter dissolved in the water. They belong to the class known as *chalybeate* waters, which contain iron as the most active and important element. Such springs are readily recognized by the yellow or ochreous deposit along the line of flow.

They are limpid or perfectly transparent when they first issue from the ground and when first bottled, but on standing 24 hours, a yellowish sediment falls down consisting of iron, lime and magnesia. This takes place in consequence of the loss of carbonic acid, the matter in solution being retained by an extra atom of carbonic acid, and hence while the salts are held in solution they are bi-carbonates. When the water is exposed to the air the feeble affinity of this extra atom of carbonic acid is such that it soon escapes and the remaining compound in the water is no longer soluble, and hence, is deposited in a powder. A tumbler of those waters standing in the open air shows the escape of a gas which is carbonic acid. When the fresh water is shaken with a solution of red cabbage changed to a tinge of green by ammonia or an alkali, it becomes purplish again by the carbonic acid which is escaping.

It is claimed that some of the springs contain sulphur; those which have been subjected to the action of basic acetate of lead, have scarcely a perceptible effect upon this delicate test. Silver vessels which have been used many times become slightly tarnished in certain spots. Hence, it is possible, sulphuretted hydrogen escapes in exceedingly minute quantities.

The springs usually flow out of banks of gravel and sand in place, and which was derived from granite or gneiss. These banks are more or less ferruginous, but in the best waters they probably flow from the granite, and thence percolate through the soil.

Composition of some of the waters of these springs:

§ 59. *Carter spring*, at the garden, one mile and a half from town. The whole amount of solid matter held in solution in a gallon of water is 16.72 grains. It consists of chloride of lime, organic matter, bi-carbonate of iron, lime and magnesia. In all cases, the organic matter is in the condition of humic, crenic and apocrenic

acids, which are also in combination with the mineral matter. It contains also silicic acid.

The *Ingleside spring*, two miles east of Raleigh, is in a fine grove, and fine drives might be cut out by opening roads, or fine walks, as they would be shaded by avenues of trees.

This spring contains solid matter, about 15 grains to the gallon, consisting of organic matter, iron, lime and magnesia. The chloride of lime was not tested for, but as it is usually present, so probably it is in this water. Its use has had a beneficial effect upon invalids in several instances.

The analysis of the spring upon Mr. Boylan's land, was not preserved; it scarcely differs from the foregoing in the amount of solid matter, to the gallon. The water is pleasant to drink, and is peculiar in its taste.

The water of a spring in Franklin county resembles also the foregoing. One pint of this water contains:

Iron, in combination with carbonic and organic acids,	.27
Lime, .....	.34
Magnesia, .....	.10
Organic matter as a whole,	2.13
	<hr/>
	2.84

To the gallon 22.77 grs.

The Dodd spring has a temperature of 60°, air being 78. The solid matter in a gallon amounts to 16 grs. In a pint it contains:

Organic matter, .....	.90
Iron in combination with organic matter, .....	.40
Carb. of lime, .....	.24
Carb. of magnesia, .....	.10

Besides the foregoing, we obtained both the chlorides of lime and magnesia, the latter in a large trace. The Dodd spring differs from the Franklin county spring in containing less organic matter, and hence, it is that the iron in it, is more distinct to the taste.

The yellow powder deposited from mineral springs has a complex composition. It consists of humic acid, erenic and apo-erenic acids in combination with the iron, a portion of the carbonic

acid having escaped. The two last acids are detected by the action of acetate of copper upon the alkaline solution of this ferruginous deposit. There is no doubt, also, that phosphoric acid is present in the compound.

§ 60. The wells of Fayetteville street deserve a place among mineral waters. They differ from the springs simply, in the absence of iron. The well at the corner of Fayetteville street leading to the depot, contains 23.92 grains of solid matter to the gallon, containing alumina, sulphuric and muriatic acids, lime, magnesia and organic matter, both vegetable and animal. Mr. Askew's well contains to the gallon, 21.36 grains; organic matter 11.68; saline matter 9.68. The market well contains 18.80 grs. to the gallon; organic matter 7.20; saline matter 13.20.

The Doctor's well contains 21.44 grains of solid matter to the gallon, saline matter 8.16, organic matter 13.28.

To repeat once more, the saline matter in the foregoing wells consists of, 1, chlorides, or we may call them muriates, muriates of lime and magnesia; 2, sulphates, as sulphate of lime, together with organic matter. The saline matter is white and free from iron, or merely traces of iron. The brown or gray crust upon the tea kettles consists of the sulphates and carbonates of lime; the latter is formed probably from the organic salts.

The salutary effects of the spring water, which we have witnessed in several instances, is to be attributed to the iron, which is perfectly dissolved in the water when it issues from the fountain, in which condition it is readily absorbed into the system. The other substances, however, are regarded as aiding in the general effects.

GEOLOGICAL AND NATURAL HISTORY SURVEY

OF

NORTH-CAROLINA,

PART III,

BOTANY:

CONTAINING A CATALOGUE OF THE PLANTS OF THE STATE,
WITH DESCRIPTIONS AND HISTORY OF THE TREES,
SHRUBS, AND WOODY VINES,

BY

REV. M. A. CURTIS, D. D.

RALEIGH:

W. W. HOLDEN, PRINTER TO THE STATE.

1860.

1861

IN THE

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RALEIGH, JUNE 1ST, 1860.

To His Excellency, JOHN W. ELLIS,
Governor of North-Carolina :

SIR:—I herewith transmit the Report of the Rev. M. A. Curtis, D. D., upon the WOODY PLANTS of this State.

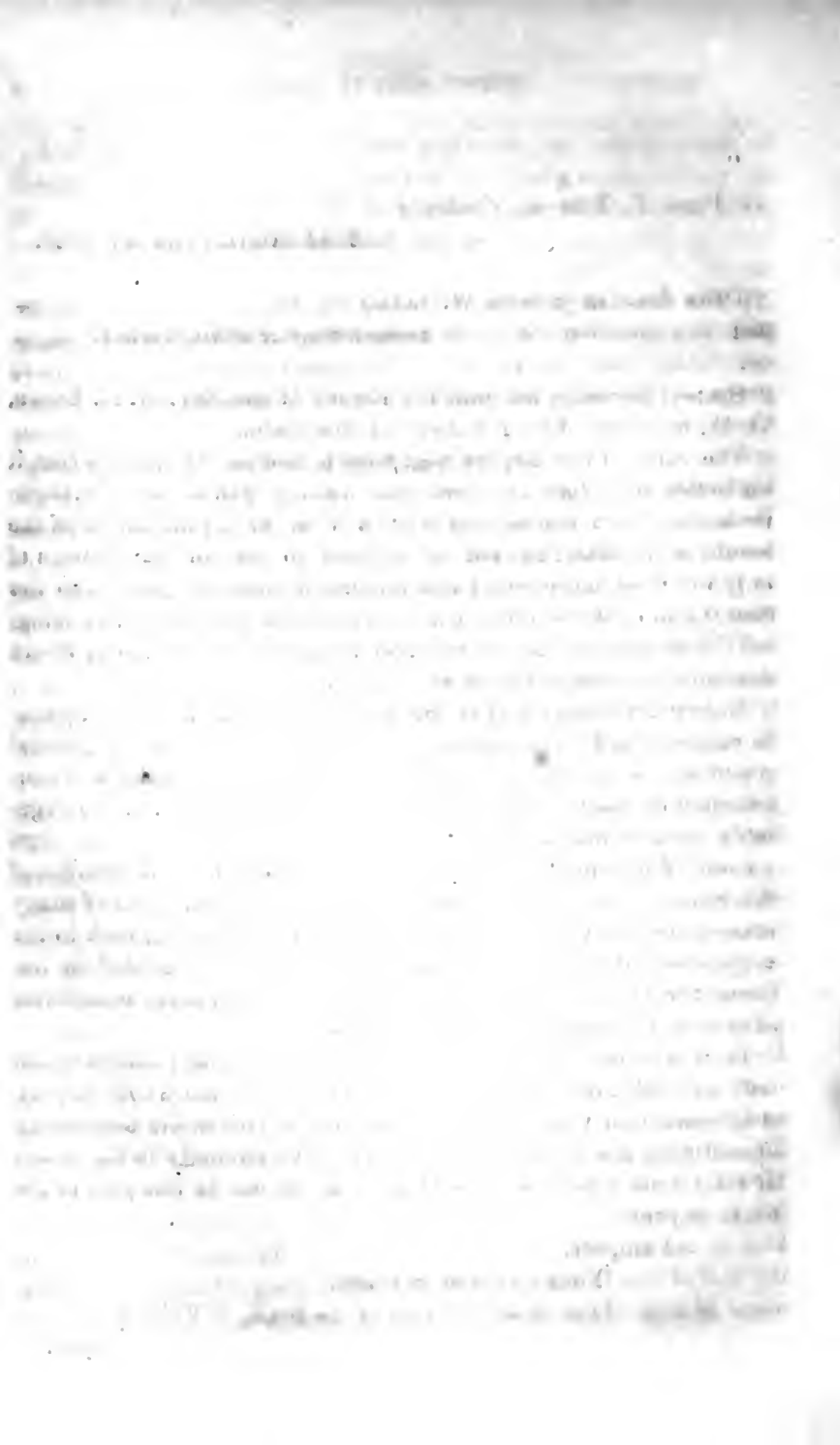
The value of this Report is greatly enhanced by the fact that it embodies the labor of more than twenty years. Dr. Curtis, in reviewing the whole subject with a view to a publication of the results of his labor, has felt constrained to furnish descriptions of only the most conspicuous and important plants indigenous to the State; and of the less important ones a Catalogue simply, noticing, with each species, its geographical range in the State, and, where desirable, its economical or medicinal uses.

Notwithstanding the latter portion of his Report may thus appear to consist chiefly of technical names, and thus be of no general practical use, it will be regarded by the scientific public as a contribution of great value, not merely for its indication of the vegetable productions of this State, but also as containing a large amount of information not elsewhere to be found. The position of this State is such that it forms the north and south limits of many interesting productions in Natural History, belonging both to the vegetable and animal kingdoms; and it has been regarded an important work to fix definitely the true north and south boundaries of species belonging to these kingdoms.

In view of these considerations, together with many others which will, no doubt, be suggested on reflection upon the whole subject, it is hoped that your Excellency, with the Honorable Gentlemen constituting the LITERARY BOARD, will give publicity to the labors of Dr. Curtis, who has consented to assist me in this part of the State Survey.

I am, Sir,
Your obedient Servant,

E. EMMONS,
State Geologist.



To PROF. E. EMMONS, *Geologist*
of the State of North-Carolina:

DEAR SIR: In compliance with your request, that I would furnish, in connexion with your general Survey of the natural resources of the State, an account of its vegetable productions, I have prepared the following paper upon the WOODY PLANTS of North-Carolina. I have brought these together in one view, because they are the most important, the best known, and can be more intelligibly arranged for general use, than upon a plan strictly scientific. Botanists will of course find fault with it; but as my sole purpose herein is to make this essay of popular service, and as intelligible as possible to those who know nothing of systems and would not take the time or trouble to master a scientific treatise, I have adopted the present course as the most likely one that occurred to me to accomplish the end proposed. It has its difficulties, as you will readily see, but you will at the same time confess, I think, that, though it might be better done, the end could not be so well attained but by some such arrangement. I must therefore crave your indulgence for this departure from established usage in this first portion of my Report.

I have felt somewhat hampered by the limits to which I was restricted, and, as it is, have unavoidably over-run them; but I hope, nevertheless, that nothing essential has been often omitted, either in the descriptions, or in noticing the valuable uses, of the various Trees, Shrubs and Vines of the State. In instances where the plant is well known and needed no discrimination from similar or kindred species, I have omitted all description, as being in such cases superfluous. But whenever one is less known, or may be easily confounded with others, I have endeavored to present all the distinctive characters by which it may be discriminated from them. How far I have been successful must be left to the proof by trial; but I am pretty confident that a person wholly unpractised in this kind of investigation can, by means of the Tabular View given at the end of this Report, very soon learn to discriminate and find the name of most of the Woody Plants of the State.

I will state in conclusion, what you were not before aware of, that this Report is one of the fruits of your long continued service in the field of Science. My first knowledge of the elementary terms of Botany was derived from yourself and your distinguished Preceptor, Prof. EATON, at the beginning of your public career. Though I was then too young to be admitted to your course of instruction, an impulse was then given which never abated, and now, forty years afterward, returns back to you with this humble offering. The contribution is, therefore, most appropriately put into your hands by

Your friend and servant,

M. A. CURTIS.

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P R E F A C E .

THE Plants of North-Carolina have long been considered by Botanists as unsurpassed in variety and beauty by those of any States of the Union, excepting a few of those which lie upon the Gulf of Mexico. The Flora of this State should properly be regarded as forming the transition between the Northern and Southern Botanical Districts, as it is within our boundaries that many of the Northern plants have their Southern limits, and some of those which form a peculiar feature of Southern vegetation commence. Of the latter species are the *Pond Pine*, several *Magnolias*, *Palmetto*, &c. There is still another circumstance which gives a much greater variety to our vegetation than could be derived from mere difference of $2\frac{1}{2}$ degrees of latitude between her Northern and Southern boundaries. The Mountains on the Western border of the State are several hundred feet higher than any others in the Union, so that the difference of elevation between these and our sea-coast occasions a difference of vegetation equal to that of 10 or 12 degrees of latitude. Thus upon the higher summits are found species such as belong to the White Mountains of New Hampshire, those in the N. E. part of New York, and to Canada. The intervening ranges of Virginia and Pennsylvania partake, in part only, of the same peculiarities, but the greater elevation of some of our summits permits the growth of some species which are unknown between them and the Northern regions above mentioned.

In the distribution of Plants over the State we have three distinctly marked Districts, as well characterized by their Flora as by their Geological features. As in the Geology of the State the peculiar formation of one District may penetrate, overlies, or underlies that of another, yet the predominating characters of each be sufficiently marked and striking to arrest the notice of the most casual observer; so it is with the vegetation of these Districts. The analogy of distribution between the objects of these sciences may be extended still further. For as, in the one case, we often

meet with misplaced Rocks, so, in the other, the Botanist is sometimes surprised by meeting with species of Plants quite out of their proper range, and for whose location it is not always easy to account. Thus the *Cranberry*, an inhabitant of elevated regions and not uncommon in our Mountain Marshes, is also found, to a limited extent, in the low lands of the Northeastern part of the State. The beautiful *Calico Bush*, or *Ivy*, rarely found but in rocky regions, as in the mountains or along the rocky banks of water courses, occurs abundantly in the Dismal Swamp, especially along the line of the Canal. The pretty *Roanoke Bell* (*Mertensia Virginica*,) a native of the Mountains, is scattered along the banks of the River from which, in this State, it derives its name, as far down as Halifax county. In this last case, and perhaps in some others, we may suppose that seeds have been carried down by streams which head in the mountains. But in regard to some species, as the fragrant *Wintergreen* or *Mountain Tea* (*Gaultheria procumbens*,) they sometimes attain such a wide distribution in their new (?) position, and at such a distance from the larger streams, as to suggest a doubt whether they are not truly indigenous to the spots they occupy. Still, as above remarked, the general aspect of the vegetation of either region is no more affected by these rare exceptions, than is that of the geological features of a district by a few scattering boulders. The most careless observer can not fail to observe how essentially the vegetation changes, as he passes from our sandy low country into the red clay region of the middle country. The difference is as remarkable as that of the soils. The absence of the *Long-leaf Pine* marks the transition to the Middle Botanical District. A line drawn from Blakely on the Roanoke, in the direction of Cheraw on the Pee Dee, will very nearly indicate the Western termination of the Lower District; although the actual boundary limit between these two is as irregular as a line of sea-coast, which, very probably, this once was. Occasionally, as before hinted, the vegetation of the Lower District is found considerably overlapping that of the Middle, and the *Long-leaf Pine* to occur some miles within the red clay region. Thus a patch of this tree may be seen on the gravelly hills eight miles west of Wadesboro', which is probably the most western limit of its appearance within the State. Not unfrequently also there are found small portions of land in the Middle District, very much resembling the Savannas

and low pine woods of the Lower, the soil being sandy, turfed with coarse grasses, and shaded with *Short-leaved Pines*. In these situations, which are met with as far West as Henderson county, will always be found some species of plants, which, except in such places, are peculiar to the Lower District.

The Lower District might easily be divided into three Botanical regions, each characterized by certain species of plants of well defined range. These will be only indicated, as details are unnecessary to the purpose in view. The first region includes only the line of sea-coast which produces maritime species, or those which grow only within the influence of a saline atmosphere. These are not numerous, and the only ones of much note are the *Live Oak* and *Palmetto*. The second region extends inland as far as the *Long Moss* is produced. The third, from thence to the Middle District.

The Middle District reaches westward to the base of the Blue Ridge. In this the forests are characterized by a predominance of *Oaks*, as the Lower is by the presence of *Pines*. It is far less productive of rare and peculiar plants, than either of the others. Though it furnishes some that do not belong to the others, the great majority of them are common over a large portion of the Southern and Middle States. I can not recal any one species which can be considered as giving a character to this district distinct from that of the States lying north or south of it. There are, indeed, a few of the smaller plants which are not found elsewhere, but these are so rare and inconspicuous as not to form a noticeable feature in the vegetation of this district.

The Upper or Mountain District is as peculiar and interesting in its vegetable products, as it is attractive in its scenery. The ascent of every hundred feet presents new and varying species, until we reach the region of the dark and sombre *Firs*, where we have a vegetation almost entirely Northern. There is also a striking peculiarity in the vegetation of these higher regions, which can rarely fail to arrest the eye of a visitor from the Lower or Middle Districts, in the profusion of graceful *Ferns* and delicate *Mosses* that cover the earth, and of numerous and various colored *Lichens* that clothe the rocks and trees. These, for the most part, are identical with species found in the mountains of the Northern States, and many are common to similar situations in the Old World; though there are some which seem to be confined to our own

mountains. In these orders of Plants this district abounds much beyond the product of all the rest of the State, and he who delights in their study could scarcely find elsewhere a more luxuriant field for observation or collection. But not less peculiar, and what is still more likely to attract the attention of the common observer, are the variety and beauty of stately trees and ornamental shrubs, which are found in no other part of the State. Indeed, in all the elements which render forest scenery attractive, we may safely say that no portion of the Eastern United States presents them in happier combination, in greater perfection, or in larger extent, than do the mountains of North-Carolina, especially in the counties of Yancey, Buncombe, Burke and Haywood.

From the great elevation and extent of our Mountains, supplying many forms of plants proper to much higher latitudes, besides a large number peculiar to the Southern ranges, it is not surprising that these Mountains attracted the early attention of Botanists, and that they have continued to be visited by a larger number of them than has any other portion of our country. A brief account of these Botanists, and of those who have examined other parts of the State, will be an appropriate introduction to the accompanying list and description of the objects by them first brought to public notice.

WILLIAM BARTRAM, of Philadelphia, visited the Mountains of Cherokee in 1776. He also passed through the lower section of the State. An interesting volume of his "Travels" was published in London, but the book has been long out of print.

ANDRÉ MICHAUX, under the patronage of the French government, visited the same region in 1787. In the following year he explored twice the Mountains of Burke and Yancey counties, carrying away in the Fall 2500 specimens of Trees, Shrubs and Plants. In 1794 he again visited the same region, ascending Linville, Black, Yellow, Roan, Grandfather and Table Mountains. In the following year he twice passed over portions of the same. Traditions of this indefatigable and eccentric traveller are current in the western counties, and persons are probably yet living who remember him. The late Col. Davenport, of the Yadkin Valley, was his guide on several occasions. A very large and interesting portion of our Mountain species was first discovered by Michaux, and published in his *FLORE BOREALI-AMERICAINE*, which is yet a standard and

classical work in Botanical literature. With rare exceptions his species have been since identified by other explorers.

Mr. FRASER, a Scotchman, made botanical collections in our mountains between the years 1787 and 1789. Under the patronage of the Russian government he explored them again in 1799, accompanied by his eldest son. It was on this journey that the splendid *Laurel*, or *Rhododendron Catawbiense* of Botanists, was discovered, which, with the varieties obtained by skilful cultivation, was for long the pride of the English Florists. Both revisited the country in 1807. After the decease of the father in 1811, the younger Frazer returned hither and passed several years in diligent examination of the Mountains, annually sending large quantities of ornamental plants and seeds to Great Britain. He is well and respectfully remembered by those who made his acquaintance, especially in Burke county.

MONS. DELILE, French Consul at Wilmington, in the early part of this century, sent valuable collections of plants from the Cape Fear region to Paris, which are acknowledged in the writings of several European authors.

Mr. JOHN LYON, of Great Britain, was an assiduous collector of our plants, and contributed very largely of our most interesting species to the English gardens. He probably was in our mountain region previous to 1802, but of this I have no positive information. He, however, spent several years there at a subsequent period, and died at Asheville in September, 1814, aged 49 years. A plain marble stone marks his last resting place in the grave-yard at Asheville. A manuscript Flora, which he seems to have compiled for convenient use as a manual, from such works as had then been published on American plants, is now in my possession.

F. A. MICHAUX, son of the Michaux mentioned above, and who accompanied his father in some of his visits to this country, traversed a portion of our mountain district in 1802. The result of his explorations in various parts of the country, is contained in his large work on the *FOREST TREES OF NORTH AMERICA*,* illustrated with beautiful colored Plates. I am much indebted to this valua-

* An exquisitely beautiful edition of this work was published in 1857, by Rice and Hart of Philadelphia, in five volumes;—the last two added to the original work by Mr. Nuttall.

ble work for information upon the economical value of our timber trees given in the following description of our Woody Plants.

FREDERIC PURSH, a German, author of a valuable FLORA OF NORTH AMERICA, and who travelled extensively in the Northern and Middle States, pretends to have extended his journeyings to North-Carolina; but his statement is deemed rather more than doubtful.

Mr. KIN, a German Nurseryman, living at Philadelphia, visited our State in the early part of the present century. He was a man of little cultivation, not properly a Botanist, and his discoveries were published by others.

THOMAS NUTTALL, an Englishman, but long a resident in this country, a most accomplished Botanist, who has contributed as much as any one man to the discovery and elucidation of the floral treasures of North America, examined portions of our mountain and lower districts. He is the author of GENERA OF NORTH AMERICAN PLANTS, and of many important botanical papers in the scientific journals of this country. He died in 1859.

H. B. CROOM, Esq., and Dr. H. LOOMIS, made a pretty careful exploration of the vicinity of Newbern, and their observations were published, in 1833, in a Catalogue of Plants of Newbern and vicinity. A second and enlarged Catalogue was printed in 1837 by Mr. Croom. In this the services of Mr. GEO. WILSON are acknowledged for valuable contributions to the knowledge of plants around Newbern.

In 1833, I published, in the Boston Journal of Natural History, an Enumeration of the Plants growing around Wilmington, the fruit of diligent examination made during a residence there of two years and a half. Occasional visits since made have increased the number of species known in that most interesting locality, the Flowering Plants and Ferns of which exceed one thousand.

Dr. JAMES F. McREE, of Wilmington, has devoted much time to a study of the Plants of that neighborhood, and the completeness of the above Enumeration is not a little due to his observation and assistance.

The late Rev. Dr. L. D. von SCHWEINITZ, of Salem, has contributed very largely to a knowledge of the Botany of this State, particularly in its lower orders, or those having no proper flowers, as *Mosses*, *Fungi*, &c. In these departments he was the most expert

and accomplished Botanist that our country has produced. In 1821 he printed at Raleigh a small Tract of 27 pages upon the *Hepatic Mosses* or *Liverworts*, most of which he had observed near Salem. In 1820 he published in a Scientific journal at Leipsic a paper upon the *Fungi* of North Carolina, containing descriptions of a large number of species previously unknown, some of which are illustrated by very good figures. A similar paper upon the *Fungi* of the United States, printed in 1831 in the Journal of the Philosophical Society of Philadelphia, contains a large amount of North-Carolina species not included in the former paper. These were the first treatises of the kind produced in this country, and the list of species given in the following report will embrace a large number derived from them. This learned and most estimable gentleman, a worthy descendant of the celebrated Count Zinzendorf, departed this life, February, 1834, at the age of 54 years.

The Rev. Dr. MITCHELL, during one period of his Professorship at our University, was an assiduous cultivator of Botanical Science, and had made a considerable collection of specimens, which he generously shared with Dr. Schweinitz and myself. I am indebted to him for several species which had otherwise been yet unknown to our North-Carolina Flora. A species of *Carex*, named after him, commemorates his devotion to the beautiful science. This is a petty tribute to his name; but others have honored it in better proportion to its worth. MT. MITCHELL, the loftiest summit of the Black Mountain range, the witness of his laudable triumph when he first ascertained its surpassing height, and which alone saw the sad catastrophe of his death in the darkness of night and storm, is his noble monument and his tomb.

Dr. CYRUS L. HUNTER, of Lincoln county, has devoted considerable attention to the study of Plants in his vicinity, and I am indebted to him for information which will be acknowledged in another place. He published in the Charlotte Journal (for 1834?) a list of such plants as he had observed in his neighborhood.

Prof. A. GRAY, of the University of Cambridge, and JOHN CAREY, Esq., of New York, examined the principal mountains of Ashe and Yancey in 1841, and detected several species of plants which had escaped the notice of previous investigators. An interesting account of this expedition may be found in an article by Prof. Gray in the American Journal of Science, Vol. XLII, to which I am in-

debted for much of the information here given of the early explorers of our alpine district.

The same distinguished Botanist, with Mr. SULLIVANT of Ohio, in 1843, entered our mountains from Virginia, the former continuing along the range to Georgia; the latter leaving the State by the French Broad River. The results of this tour have not been formally published. Large collections, however, were made by Prof. Gray for the Botanic Garden at Cambridge; and two beautiful volumes of specimens of *Mosses* and *Liverworts* were prepared by Mr. Sullivant, which were gratuitously distributed among Naturalists in this country and Europe. In a subsequent year Mr. S. made a Botanical reconnoissance in the low country of North-Carolina.

Mr. S. B. BUCKLEY has also made valuable contributions to our knowledge of the Flora of Western Carolina. In 1842, he entered the State by the Hiwassee River, spending the summer in a careful examination of the principal summits and water-courses as far as Yancey county. Several new species were detected by this gentleman and published in Vol. XLV of Silliman's Journal. Since the above date he has made several visits to the same region.

Mr. RUGEL, a German collector of plants, spent some time in our mountains in 1842. His discoveries were published by Shuttleworth and others.

Mr. Dow, a young Botanist, traversed the whole length of our mountain range in 1844, but I have never learned if his observations and discoveries have been made public.

The writer of this, during a residence near the mountains in 1835-'6, had occasional opportunities of visiting the high ranges in Burke and Yancey, as also the counties of Lincoln, Mecklenburg, and Caldwell. In 1839, he spent the summer in traversing the mountains from Ashe to Georgia. A visit of a few weeks was again made to Ashe and Yancey in 1845; and another in 1854 to Buncombe and Henderson. Besides these, a residence of some years in various portions of the middle and lower sections of the State, comprising in all about 20 years, has given him opportunities of becoming acquainted with the vegetable productions of the State, of which he has assiduously availed himself, and the results have been published in various journals in this country and England. The accompanying list of species contains all that is known of the plants of North-Carolina; a longer list than has yet been published of any State in the Union.

It may be expected, perhaps, that in enumerating those who have contributed to a knowledge of the natural productions of our State, I should not omit a notice of Lawson's History of North-Carolina, the first printed work devoted to this subject. But besides that this book is now nearly inaccessible, there being but a single copy in the State, we cannot always recognize the objects described in it, the application of Indian names being lost, and that of English names rather variable and uncertain. So far as I have been able to authenticate species noticed by Lawson and other old journalists quoted in Dr. Hawks' History of North-Carolina, I have done so in the April No. (1860) of the North-Carolina University Magazine. The information upon the Natural History of the State contained in their works is now of no scientific or economical value, and their errors in statement are not few.

In the following arrangement of our Woody Plants, I shall not be governed by established scientific rules, but shall adapt it, as well as I can, to the comprehension of those who know nothing at all of Botany as a science. I hope, in this manner, so to present our TREES, SHRUBS and CLIMBERS, that the most, if not all of them, shall be easily recognized with very small expenditure of patience and study. The well known popular names applied to most of the species and genera will greatly facilitate the success of this arrangement.

The above mentioned Divisions will be sub-divided according to the nature of the fruit in each, some groups having *cones*, like the Pines; some, *nuts*, like Oaks and Hickories; others, *fleshy* or *pulpy fruit*, like the Apple and Plum. A tabular view of this classification will be given at the end of this Report.

. The scientific names will, in all cases, correspond with those in Dr. Chapman's FLORA of the SOUTHERN UNITED STATES.

THE TREES

OF

NORTH-CAROLINA.

PINES.

These have their fruit in large scaly *cones*, popularly called *burs*, and have evergreen needle-shaped leaves, two to five enclosed in a sheath at their base.

1. **YELLOW PINE.** (*Pinus mitis*, Michx.) This, with us, is called *Short-leaved Pine* and *Spruce Pine*. The first is objectionable, because we have at least two species with shorter leaves; and the second, because another is more appropriately called by that name. I have therefore adopted the name by which it is known in the Middle States, and recommend its use here, as it is much to be desired that there be a greater uniformity in the popular designations of our forest trees. In the great confusion now prevalent, it is often quite impossible to ascertain what is meant by the names of our most common trees and other plants. This is perhaps the most widely diffused of all our Pines, it being common from New England to Florida, mostly in light clay soils. With us it is found from the coast to the mountains, but more rarely in the Lower District, and it enters into the composition of most of our upland forests. It is from 40 to 60 feet high, with a circumference of 4 or 5 and even 6 feet. The limbs on the upper part of the tree are more inclined towards the trunk than those of our other species, so as to give somewhat of a pyramidal form to the top. The leaves are 2 to 5 inches long, generally two, but sometimes three, in a sheath. The cone or bur is the smallest of all our species, rarely attaining a length of 2 inches, the tips of the scales armed with slender short prickles. The heart-wood is fine grained and but moderately resinous; but the sap-wood soon decays. The timber is extensively

used in house and ship building, though not deemed so valuable as that of the *Long-leaf*. When grown in very rich soils, I believe its timber is coarser than when raised in less fertile land.

2. JERSEY PINE. (*P. inops*, Ait.)—This tree is generally confounded in this State with the preceding, and also called *Short-leaved Pine* and *Spruce Pine*. In some parts of the country it is known also under the names of *Cedar*, *River*, and *Scrub Pine*. The name which I have adopted, after Michaux, seems to have originated from its being a prevalent tree in New Jersey, where it has its northern limit, and from whence it is found, on barren and gravelly hills, to the upper part of Georgia. In such situations it is found in the Middle and Upper Districts of this State, but nowhere very abundant. It is from 20 to 40 feet high, and 12 to 15 inches in diameter, with rather distant, spreading and drooping branches. The young branches are smoother in this than in other species. The leaves are two in a sheath, 1 to 2 inches long, about half the length of those of the preceding species, while the cones are considerably larger than in that, being 2 to 2½ inches long, and armed with longer and stouter sharp prickles. This tree is too small, often crooked, and generally with too much sap-wood, to be of any value.

3. PRICKLY PINE. (*P. pungens*, Michx.)—The name here given is but a translation of the scientific one, as I could never learn that it was distinguished from the *Yellow Pine* by the inhabitants of the region where it grows. In some books it is called *Table Mountain Pine*, because it was originally supposed to be pretty much confined to that mountain and its immediate neighborhood. But as I have seen it from the mountains of Virginia and Georgia, and from Pilot Mountain in this State, far east of the Blue Ridge, and have found it common on all the eastern spurs of the Blue Ridge, (never west of it,) in the northern portion of our mountain range, such a name is too local to be at all appropriate. This species is, however, the least widely diffused of any North-American Pine. The tree is not very symmetrical, is from 30 to 50 feet high, and 12 to 20 inches in diameter. The leaves are in *pairs*, as in the two preceding species, but much thicker and stiffer than in those, and about 2½ inches long. But the cones give the chief peculiarity and interest to this Pine. They are of a light yellow color, very compact, 3 inches long and 2 inches broad at the base, the scales armed

with very broad strong sharp spines, which are one sixth of an inch long and bent toward the top of the cone. In the strength and sharpness of these spines we have no other species with which we can compare this. I have never learned that the timber of this tree is of any special value.

4. **PITCH PINE.** (*P. rigida*, Mill.)—Generally known by this name, but, according to Michaux, sometimes called *Black Pine* in Virginia. I think it is, in North-Carolina, confounded with the *Yellow Pine*, as I have not heard any distinctive name for it, though its leaves are in *threes*, (rarely in fours,) 3 to 5 inches long, and more rigid than in the latter. The tree is 30 to 50 feet high, with a rough blackish bark, the branches numerous and occupying two-thirds of the trunk, thus rendering the wood very knotty. The cones are 2 or 3 inches long, of a light brown color, often growing in clusters of 3 to 5, and the scales having sharp reflexed prickles. The wood is compact and heavy, filled with resin, though when grown in low grounds it is much lighter and has much more sap-wood. It is a good deal used in some parts of the country, but being inferior to the *Yellow Pine*, and much less common with us, it is not deserving of much consideration. It is no where common in this State, and I have not observed it any where east of Lincoln county, though it is probably scattered sparingly through the Middle District. It is found northward as far as New-England, and southward, I think, to Georgia.

5. **POND PINE.** (*P. serotina*, Michx.)—This has considerable resemblance to the *Pitch Pine*, but is as remarkable for its scattered branches as that is for its crowded ones. They are, however, in no danger of being confounded in this State, as I do not think they are found in the same sections. But it is very frequently confounded in the low country with the *Loblolly Pine*, though very readily distinguished from that by its cones. It is common in the small swamps or bays of the Lower District, in company with *Sweet Bay*, *Sour Gum*, &c., and occasionally in similar situations in the Middle. It sometimes covers pretty large tracts of rich swampy and peaty lands, but never, I think, constitutes any extensive forest. In some localities it is called *Savanna Pine*. The leaves of this species are in *threes*, and 5 to 7 inches long. The cones are remarkable for their short form, compared with their size, being about $2\frac{1}{2}$ inches long and 5 in circumference at their base, armed with

very short fragile prickles. They grow in clusters, often surrounding the branch, are of shining light brown color, and remain closed until the second year. They are deemed ornamental enough to grace the mantel in some houses. This tree is generally about 40 or 50 feet in height, but in favorable soils rises as high as 60 and even 80 feet. The wood is of better and more durable qualities than that of the *Loblolly*, and is occasionally used for the masts of small vessels. It is not known to exist north of this State.

6. LOBLOLLY OR OLD FIELD PINE. (*P. Tæda.*)—This tree has its northern limit in or near the District of Columbia, gradually becoming more abundant to the southward, until, in this State, it is the most common Pine, next to the *Long-leaf*, in the lower district. It is there found wherever the soil is dry and sandy, as well as in some of the smaller swamps; but is replaced by the *Yellow Pine* on clayey and gravelly soils. In exhausted fields out of cultivation it almost invariably springs up, which gives the origin of one, and in this State the most common, of its names. Its leaves are from 6 to 10 inches long, clustered by *threes* (very rarely 2 or 4,) in a sheath. The cones are 3 to 5 inches long, the scales armed with rather strong sharp prickles. The trunk rises to the height of 50 and 70 feet, with a diameter of 2 and 3 feet, and has a spreading top. The wood is sappy and coarse-grained, liable to warp and shrink, and soon decays on exposure. It is among the least valuable of our Pines, but is sometimes applied to inferior uses. It affords a good deal of Turpentine, which is less fluid than that from the *Long-leaf*. This tree extends somewhat into the Middle District.

I am indebted for the knowledge of an important variety of this tree, known as the *Swamp* or *Slash Pine*, and about Wilmington as *Rosemary Pine*, to some articles in Russel's Magazine, written by Mr. Edmund Ruffin, of Virginia, who has made a careful examination of the characters and habits of our southern Pines. He says: "This [Slash Pine] tree grows only on low and moist land, and is the better for timber, and grows larger in proportion to the greater richness of the land. It is the principal and largest timber Pine in the original forests of all the low, flat and firm but moist lands bordering on Albemarle Sound, and also farther South; and I have seen it growing as well, but much more sparsely, on the rich swampy borders of the Roanoke and in the best Gum lands

bordering on the Dismal Swamp, and some on the low bottom lands of Tar River. Among the other gigantic forest trees on the rich and wet Roanoke Swamps, (on the land of Henry Burgwyn, Esq.,) mostly of Oak, Gum, Poplar, &c., the few of these Pines which yet remain, tower far above all others (20 feet or more) so as to be seen and distinguished at some miles' distance. I have visited several standing trees and the stumps of others which had been cut down, which measured nearly or quite five feet in diameter, and were supposed to have been from 150 to 170 feet in height. But the sizes and heights of the trees may best be inferred from the list below of hewn (or squared) stocks, which was furnished to me from Mr. Herbert's* timber accounts. These stocks were cut in Bertie county, made the whole of one raft which was then (May, 1856,) on its passage through the Dismal Swamp Canal to New-York. The stocks were thence to be shipped to Amsterdam for naval construction, under a contract with the Dutch government.

	Length.	Inches Square.	No. of Cubic Feet.
1	47	25	204
2	66	19	165
3	86	30	537
4	79	31	527
5	88	23	337
6	65	20	181
7	74	26	347
8	80	26	376
9	68	24	272
10	58	22	195
11	86	30	537
12	58	30	363
13	74	26	347
14	74	26	347
15	70	28	381
16	70	27	368

But even the longest of these stocks do not approach the magnitude of one which was cut at a previous time in Bertie and sold in New-York by Mr. Herbert. This was 80 feet in length and 36 inches square at the lower end. He sold it to a dealer for \$500,

* Of Virginia, a large contractor for the supply of timber to the Navy Yards.

and the buyer resold it for \$600. This stock did not retain its stated diameter (at the butt) to its upper extremity, but there was from 28 to 30 inches square. All of these stocks were nearly all of heart wood. Of course this condition permits but little sap-wood, and that only in the angles of the squared stocks. Thence, also, it follows that the proportion of heart wood in these trees must be very large. The timber must be resinous or it would not be good, and it must be durable or it would not serve for the masts and other great spars of ships of war, exposed to alternations of wetting and drying, and for which the best materials only are permitted to be used. The grain of this heart wood is not generally very coarse, but more so than the *Long-leaf*; and still more than the *Short-leaf* [or] *Yellow Pine*."

7. LONG-LEAF PINE. (*P. australis*, Michx.)—The invaluable tree by which the country, and this State especially, have so largely profited, is generally known among us by the name here given, though it sometimes is called *Yellow Pine*. In the Navy and Dock yards of the country it bears the latter name, though this designation there includes also the *Swamp* or *Rosemary Pine*, as well as the species first described in this list. It begins to appear in the south Eastern part of Virginia, and from thence to Florida it is eminently the tree of the Lower Districts of the Southern States, occupying nearly all the dry sandy soil for many hundred miles. It is from 60 to 70 feet high, in favorable situations still higher, and 15 to 20 inches in diameter. The leaves are 10 to 15 inches long, on young stocks sometimes much longer, and clustered on the ends of the branches like a broom. The cones are 6 to 8 inches long. The wood contains very little sap. The resinous matter is distributed very uniformly through it, and hence the wood is more durable, stronger and more compact; which qualities, in addition to its being of fine grain, give it the preference over all our Pines. The quality of the wood, however, depends upon the kind of soil in which it is grown, as in a richer mould it is less resinous. This inferior kind is, in some places, distinguished as *Yellow Pine*,—another case in point, illustrating the vague and indiscriminate application of the popular names of our forest trees. In some soils the wood is of a reddish hue; and this, in the northern dock-yards, is denominated Red Pine, and considered better than the others. I am informed, that trees which have a small top indicate a stock with the best heart-wood.

The great value of this tree in both Civil and Naval Architecture is too well known to justify a full enumeration of its uses, and statistics of trade in it belong rather to a Gazetteer than to an essay like this. But it is not the wood only that gives value to this tree. The resinous matter, in various forms, is shipped from our ports in large quantities to all parts of the United States and to foreign countries. *Turpentine* is the sap in its natural state as it flows from the tree. When it hardens upon the trunk, and is gotten off by proper implements, it is called *scrapings*, of very inferior value to the virgin article. *Tar* is made by burning the dead limbs and wood in kilns. *Pitch* is tar reduced about one half by evaporation. *Spirits of Turpentine* is obtained by distillation from Turpentine, including Scrapings. *Rosin* is the residuum left by distillation. The greater part of these articles found in the markets is derived, I believe, from this State.

Large tracts of this Pine are sometimes suddenly destroyed, as by a blight, to the irreparable injury of the owners, as the forests can not be reproduced in a life time. From the great value of the tree its destruction has attracted more especial notice; but our *Yellow Pine* (*P. mitis*), is subject to the same casualty. In Europe the same kind of fatality happens to the *Firs*. The mischief is caused by swarms of a small insect penetrating through the bark into various portions of the stock, and against which there is no remedy yet discovered. Other species of insect sometimes attack the Oaks and effect a similar destruction.

8. WHITE PINE. (*P. Strobus*, Linn.)—This beautiful tree, of such immense value to Canada and New England, extends along the Alleghanies to our own mountains, where it is found in considerable quantities, forming peculiar and handsome forests in the rich elevated vallies, especially of Ashe and Yancey. It is found as far south as Georgia. Though at the North this tree is as important, and its timber as extensively used, as our own *Long-leaved Pine*, yet from its inaccessibility in our mountains it has no marketable value with us, and does not seem to be much used in the region where it grows.

There are peculiarities about this tree which distinguish it at first sight, and at any distance, from all our Pines, in the pale green color of its foliage, the smooth light bark of the trunk, and the circular disposition of the limbs, which gradually diminish in length

toward the summit, so as to give this the symmetry of a Fir more than of a Pine. The leaves are also *five in a sheath*, which is the case with no other of our Pines. In favorable situations at the North, this tree has been known to reach a height of 180 feet, with a diameter of 7 feet. In our mountains it is found from 60 to 70 feet high, with a proportional diameter. The wood is light, soft, free from knots, very easily worked, and durable, though not very strong, and is applied to a far greater variety of economical uses than that of any other Pine.

FIRS AND SPRUCES.

These are distinguished from the PINES by their leaves growing singly upon the branches, (not included by twos, threes, &c., in a common sheath,) and by their cones, which are composed of thin scales without prickles, somewhat like *Hops*. They are all possessed of singular beauty, and are indispensable to the perfection of artificial groves and parks. It is only in cool and moist situations, however, that they can be fully developed; though they thrive and are very ornamental in private grounds through the Middle District of the State. They are impatient of the heat in the Lower District, and unless well shaded there, are apt to remain dwarfed, or to die out.

1. BALSAM FIR. (*Abies Fraseri*, Pursh.)—This is the handsomest of our Firs, and is very similar to the *Silver Fir* of Europe, though every way smaller; the latter sometimes attaining the height of 150 feet, while ours seldom reaches 40, with a diameter of 12 to 15 inches. It is an inhabitant of the higher mountains from Pennsylvania southward as far as this State. Farther north it is replaced by a larger but very similar species known as the *Canada Balsam*, (*A. balsamea*.) It is not uncommon on our highest summits, but I think is not found upon any which do not exceed 4000 feet above the sea. Some of these summits appear to be occupied almost exclusively with forests of this tree, and the dark color of these and of masses of the next species, has probably given its name to the Black Mountain. Several knobs and ranges south of the French Broad river are called Balsam Mountain from the prevalence of this tree upon them. When not too much crowded this has a close pyramidal top. The leaves are of a bright green above, and silvery

white beneath. When the branches are loaded with cones, (which in this species only stand erect,) the tree is very beautiful. The cones are from 1 to 2 inches long. The timber is of little value, though sometimes sawed or hewed out for mountain cabins; yet if valuable, it could not, from its location, be available. The turpentine or *balsam* is a clear thin liquid, obtained from small blisters on the bark of the trunk by means of sharp horn spoons or scoops inserted into their lower side. It is of an acrid taste and is much used by the inhabitants on cuts and sores; but the application is painful and as likely to promote inflammation as to allay it.

2. BLACK SPRUCE. (*A. nigra*, Poir.)—Common in our mountains, especially on the Black, but at a lower elevation than the preceding species. It extends from this State along the Alleghanies to New-England and Canada. In our mountains it is sometimes very improperly called *Juniper*, and it is, I believe, what is most commonly and absurdly called *He Balsam*. With us it is a small tree of darker green foliage than the preceding, but of similar form. In higher latitudes it has a height of 70 or 80 feet, and is there an elegant tree. The wood has strength, lightness and elasticity, and is much used both in the Northern States and abroad, for the yards and topmasts of vessels. The drink so popular at the North, and known as *Spruce Beer*, gets its name from the use of the small branches, chiefly of this species, which are steeped in the brew.

3. WHITE SPRUCE. (*A. alba*, Michx.)—This has about the same range in the United States as the *Black Spruce*, but does not extend quite so far to the northward. It is rather rare in our mountains, but is occasionally met with in similar situations with the other, and with which it is generally confounded by the inhabitants. In one instance I heard it called *Lavender*, a name belonging to a garden herb. It is very distinct from the preceding, and its whole aspect is lighter; the summit of a similar pyramidal form, but less compact, is of less size, with slender and more drooping branchlets, the pale green leaves of more delicate form, and the cones narrower. The wood is employed for the same purposes as that of the *Black Spruce*.

4. HEMLOCK SPRUCE. (*A. Canadensis*, Michx.)—Universally known in our mountains as *Spruce Pine*, though the name here preferred is not unknown. The latter is a very common appellation of the *Yellow Pine* in this State. The Hemlock is found as

far north as Hudson's Bay ; whether south of North-Carolina I have not learned. It is almost entirely confined, in the mountains, to the borders of torrents and cold swamps, but extends down to their very base. This is a larger tree than the preceding Spruces, but does not attain here, as in higher latitudes, the stature of 70 or 80 feet, and a diameter of 2 or 3 feet. In its light spreading spray and delicate foliage it is a more graceful tree than the others. The leaves are light green above and silvery beneath. They spread two ways upon the branches, while in all the other Spruces they spread from every part of them. The cones are $\frac{1}{2}$ to 1 inch long, and gracefully depend from the ends of the branchlets. The timber is used to some extent at the North, but is of inferior importance. The bark, however, is extensively and almost exclusively used for tanning in some parts of New-England. Though inferior to Oak bark it is said that the two united are preferable to either alone.

WHITE CEDAR. (*Cupressus thyoides*, Linn.)—In North-Carolina, and some other portions of the South, this seems to be known only under the name of *Juniper*. But as it is not Juniper, I do not hesitate to reject the name. The one above given is in common use in the Middle and Northern States wherever the tree is found. The true Juniper (*Juniperus communis*) of Europe and the Northern States is related to our *Cedar*, and its fruit is an aromatic berry ; while that of the present species is a small, dry, woody cone, composed of scales which spread open in maturity after the manner of a Pine or Cypress bur. This tree is found from Florida to New-England. In our State it is confined to swamps in the lower District, where, in some places, it is very abundant. It is 70 or 80 feet high, with a diameter of 2 or 3 feet. The various uses to which its wood is applied make it one of the most valuable trees in the country. It is fine grained, soft, light, and easily worked, and after seasoning acquires a light rosy tint. It has a strong aromatic odor, and the flavor given to water kept in buckets or piggins of this material is generally esteemed. From the little effect produced upon it by moisture or dryness, as well as for its lightness and freedom from splitting, the shingles made of it are, in some places, preferred over all others, and last from 30 to 35 years. Where it abounds, it is used in the frames of buildings, it being durable and

mostly free from worms. In cooper-work it is extensively used, and has been found very serviceable for vessels in which to preserve oils. Charcoal for gunpowder is made from the young stocks—lampblack, lighter and more deeply colored than that from Pine, is made from the seasoned wood—rails for fencing, made of the young stocks deprived of their outer bark, will last from 50 to 60 years.

N. B. The *Red Cedar*, according to its natural affinity, should be placed in this Group; but as its fruit is what is popularly called a *berry*, the present mode of arrangement requires its transfer to the Group having that kind of fruit. The *Arbor Vitæ*, also belonging here, may be found among the SHRUBS.

CYPRESS. (*Taxodium distichum*, Rich.)—This tree, so well known under this name only, needs no specific description, and I will only remark that it is the only one in this group of trees that has not evergreen leaves. Its range is along the lower region of the Atlantic and Gulf States from Delaware to Texas. In this State it has about the same range as the *White Cedar* and *Long-leaf Pine*, but is always confined to swamps. It is remarkable for its large dimensions as well as for its various uses. Its height with us is from 60 to 100 feet, with a circumference above the swollen base of 20 to 36 feet, though in the original forests of the country it has still larger dimensions. The wood has much strength and elasticity, is fine grained, lighter and less resinous than that of the Pines. Heat and moisture affect it much less than most of our timbers, and it is therefore particularly valuable in those parts of the State where both these agents have peculiar force. The timber has been much used in some places for the frame and wood-work of houses, and is said to be twice as durable as *White Oak* or *Pine*. The shingles made of it are of the most valuable kind, and will last 40 years. The business of making these is a very profitable branch of industry in the lower parts of the State. For fencing and for water-pipes the wood is of high value.

There are three varieties of this tree recognized by those who deal in its timber—the *Red*, *Black* and *White* Cypress, characterized by the different color of their heart-wood. The *Red Cypress* has its heart of a reddish tint, is preferable to the others for timber, and cannot be split. This variety is easily recognized by its straight

trunk, (not always having a swollen base,) generally with a small top, and by the wounded bark having a reddish tinge. The *Black* and *White* Cypress cannot, so far as I know, be discriminated without the aid of the axe. The *Black* has its wood duskier and heavier than the *White*, which is less resinous. According to MICHAUX, the latter grows in land constantly inundated, and the former in drier situations; but I am assured by others, that all three varieties may be found in precisely similar situations.

The foliage of this tree usually spreads in only two directions from the branchlets, like that of the *Hemlock Spruce*; but there is a variety, not uncommon in some localities, especially upon the wet savannas near Wilmington, on which the leaves are very small, growing upon four sides of the branchlets and pressed down upon them, much like those of the *Cedar*.

Cypress Knees, growing from the roots of the tree to a height corresponding with the usual depth of the water, and constituting a singular peculiarity in Cypress swamps, are, I suppose, the result of hypertrophy. Whatever be the economy or final purpose of these excrescences, there are probably few of the present day who will endorse the theory of St. Pierre, that they were designed to protect the trunk against damage from icebergs!

The Cypress has not ordinarily a very attractive form in our swamps; but when standing alone in favorable situations, it has a regular pyramidal top and is of imposing beauty. In the Bartram Garden, near Philadelphia, I have seen a stock (over 100 years old) of such exquisite symmetry, that I could not be persuaded it was a Cypress, until I had satisfied myself by a close inspection.

The next GROUP to be noticed is the most important, whether considered in reference to its numbers or its economical value, in the whole circle of Forest Trees. There will be included in it all those which bear a fruit popularly called NUTS, without reference to the more restricted scientific meaning of the word. This GROUP will thus include the Oak, Beech, Chestnut, Hickory, Walnut, and Buckeye.

OAKS.

This genus of Trees contains more species than any other in our country; and of these there is a larger number in North-Carolina than in all the States north of us, and only one less than in all the Southern States east of the Mississippi. Some of the species, however, hardly rise to the dignity of trees, though I shall bring them all together in this place, where they will most naturally be looked for.

For the better understanding of the species, they are divided into two Sections. The first is that of the *White Oaks*—characterized by the *acorns* being *annual*, the foliage of a pale or grayish aspect and without bristles at the ends of the leaf divisions—the bark of an ashy hue, and the wood generally lighter colored and of more compact texture than in the other Section. The second Section has acorns *biennially*, and the leaves (except in the *Live Oak*) are pointed with a bristle at the end of each division.

Section I is again arranged in two Divisions:—the *first* having for its type the common *White Oak*, characterized by the leaves being deeply cut from the margin toward the central nerve. The second has for its type the *Swamp White Oak*, in which Division the leaves are generally larger than in the first, and only scalloped or round-toothed on the edge. The species of the *White Oak* Section are, then, as follows:

Division 1st.

White Oak, (*Quercus alba*.)
Post Oak, (*Q. obtusiloba*.)
Over-cup Oak, (*Q. lyrata*.)

Division 2nd.

Swamp White Oak, (*Q. Prinus*.)
Chestnut Oak, (*Q. Castanea*.)
Chinquapin Oak, (*Q. prinoides*.)

1. WHITE OAK. (*Quercus alba*, Linn.)—This is found from Canada to the Gulf of Mexico, and appears to be universally known by

the name here given—one of the few instances among the Oaks, in which there is not more or less confusion of popular names, so that there is no need of offering a specific description of it. It is found in this State from the coast to the mountains; but is most abundant in the Middle District. In the Lower it avoids the barrens, and is found chiefly on or near the borders of swamps. It is only in the most favorable situations that this tree rises to the height of 70 or 80 feet, with a diameter of four or five. It is then, with its light foliage, compact and even head, and straight shaft, one of the most imposing trees in our forests. It is, however, seldom met with in our State, having a diameter of more than 2 feet, though I have seen stocks here with a diameter of 3 feet. This is probably of more general use, and more extensively serviceable, than any other of our Oaks, it being valuable for house frames, for mills and dams, vehicles, agricultural implements, coopers' ware, ship-building, and for all purposes where strength and durability are required. The bark has been deemed by some Tanners as the best kind for preparing leather for saddles and similar objects. It is sometimes used medicinally as a tonic and astringent.

The variety of this species known as the *Scaly Bark White Oak* is distinguished by the thin plates of bark that scale off from the trunk. I have not learned if its timber differs essentially from that of the other.

2. POST OAK. (*Q. obtusiloba*, Michx.)—The northern limit of this is in New Jersey, but it is not abundant and flourishing north of Maryland. From thence southward it enters largely into the composition of the forests which cover the dry and poorer soils of the Middle Districts of the South. In the Lower Districts it is less common, being mostly confined to the region of swamps and lands that have gone out of cultivation. With us it does not appear to be known under any other name than the one given above, and by which it is most generally designated; but it is elsewhere sometimes called *Iron Oak* and *Box White Oak*. The leaves are more coarsely cut than those of the *White Oak*, their divisions often enlarged at their outer ends, rather rough on the upper side, and with a gray down underneath. The acorns being very sweet and much eaten by wild Turkeys, it is in some localities called *Turkey Oak*. This tree is rarely found as high as 50 feet and with a diameter of 18 inches, but I have seen it with a diameter of 26 inches. Hence it

cannot be employed for all the purposes for which the *White Oak* is used, although in fineness of grain, strength and elasticity, it is superior to it. It is serviceable for fence-posts, (hence its name,) for the work of wheelwrights and coopers, and is used advantageously for the knees in ship-building. For the staves of liquor-casks this and the *White Oak* supply material far superior to any other of our Oaks.

3. OVER-CUP OAK. (*Q. lyrata*, Walt.)—This is unknown north of this State and does not seem to be common anywhere. In this State I know of its existence only in the rich swampy lands of the Neuse and Cape-Fear and their tributaries as far up the country as Chatham and Orange. The foliage has more resemblance to that of the *Post Oak* than of any other, for which reason it is, farther south, called *Swamp Post Oak*. It is also sometimes called *Water White Oak*. The acorn is almost wholly enclosed in its cup, (whence its name,) by which character this tree may easily be distinguished from all others. It sometimes attains the height of 80 feet and a diameter of 2 and 3 feet, and is then a majestic tree. The wood is inferior to that of the two preceding species, yet is sufficiently compact to be serviceable, if it was more accessible and more extensively diffused.

4. SWAMP CHESTNUT OAK. (*Q. Prinus*, Linn.)—Not known north of Pennsylvania, but is pretty common in the maritime parts of the Southern States, where it is met with in the rich soils of the river swamps. With a height of 80 or 90 feet and proportional diameter, a straight trunk and expansive tufted summit, it forms a beautiful and majestic tree. The leaves are 6 to 8 inches long, broader toward the outer end, with coarse rounded teeth on the edges, and pale down underneath, and of that ashy line which distinguishes all the species of this section of Oaks. The acorns are about 1 inch long, nearly half covered by the cup, and with a stem about $\frac{1}{2}$ inch long. In economical value this can hold but a second or third rank among the *White Oaks*. The timber has strength and durability, and is therefore employed for various purposes; but it is more porous than that of *White* or *Post Oak*. It has a straight split and shreds easily, and is therefore employed, especially by the negroes, in the making of baskets and brooms. Rails from this tree will last 12 or 15 years, and the fuel is considered valuable.

We have two varieties of this tree, so well marked that some

Botanists have regarded them as distinct species. But our best living Botanists now consider them as variations from one type caused by difference of soil and situation. They are as follows:

Swamp White Oak. (var: *discolor*, Michx.)—It is generally known throughout the United States by this name, and takes the place of the *Swamp Chestnut Oak* as we proceed inland from the range of the latter, and is found on the edges of swamps and inundated banks of rivers, not in the open and drier forests. It is a handsome tree of 70 or 80 feet high, with luxuriant foliage, the silvery whiteness of the underside of the leaves beautifully contrasting with the bright green of the upper surface, when they are stirred by a gentle wind. The leaves are 5 or 6 inches long, in form like the preceding, but with the marginal teeth more unequal. The acorns are supported on a stem 1 to 3 inches long, by which character this variety may be easily distinguished from every other Oak in this section. The wood is strong and elastic, and heavier than *White Oak*, to which it nearly approaches in value; though not being common, it is much less used in the arts.

Rock Chestnut Oak. (var: *monticola*, Michx.)—This is sometimes called *Rock Oak* and *Chestnut Oak*, and is found as far north as New England. It is an inhabitant only of high rocky or gravelly situations, and hence occurs only in the Middle and Upper Districts of this State. It is a showy symmetrical tree in favorable situations, with a luxuriant foliage, sometimes attaining a height of 50 or 60 feet, and a diameter of 3 feet; but from the usual barrenness of the soil where it grows, it is seldom seen of these dimensions, and is commonly not more than 30 or 40 feet high. In the leaves and fruit it differs very slightly from the *Swamp Chestnut Oak*. The timber is valuable but not equal to *White Oak*, its pores being more open. In ship-building it is used, in some places, for the lower part of the frame, for knees and ribs. It has a reddish tinge like that of *White Oak*. For fuel it is inferior only to *Hickory*. The bark is among the best for tanning.

5. CHESTNUT OAK. (*Q. Castanea*, Willd.)—Not uncommon in the Middle and Western States, but it occurs very scatteringly in the Southern. I have not noticed it in North-Carolina, but Michaux mentions a single tree seen by him on the Cape Fear, a mile from Fayetteville. He also found it on the Holston and Nolachucky Rivers in East Tennessee, and it may perhaps be found on those

streams in the western part of our State. The tree rises to a height of 70 and 80 feet, with a diameter of 2 feet, the branches rather erect than spreading. It is so sparingly diffused, that the value of the wood has never been tested; but its excessive poronsness promises poorly. It has a yellowish tinge, and is therefore known in some localities under the name of *Yellow Oak*. This species is often confounded with the *Swamp Oaks* described above, which it certainly resembles; but its leaves are narrower, shaped more like those of the Chestnut, (whence its popular name,) with the teeth nearly sharp; and its acorns are only about $\frac{2}{3}$ inch long. With its fine form and handsome foliage, this would be very ornamental in private grounds.

6. CHINQUAPIN OAK. (*Q. prinoides*, Willd.)—Sometimes called *Dwarf Chestnut Oak*. Its foliage is somewhat like that of the *Rock Chestnut Oak*, and also has some likeness to that of the *Chinquapin*, which gives it its common name. It is a mere shrub, 2 to 4 feet high, of no value, and is here mentioned only to give a complete view of the genus. It is found very sparingly in the Lower District, but is not uncommon upon poor soils in the upper parts of the State.

SECTION II contains three distinct Divisions; the *first*, with leaves narrow and entire;—the *second*, with leaves broad, generally entire, and pear-shaped; the *third*, with leaves broad and cut into several segments.

Division 1st.

Live Oak, (*Quercus virens*.)
Willow Oak, (*Q. Phellos*.)
Shingle Oak, (*Q. imbricaria*.)
Laurel Oak, (*Q. laurifolia*.)
Upland Willow Oak, (*Q. cinerea*.)

Division 2nd.

Water Oak, (*Q. aquatica*.)
Black Jack, (*Q. nigra*.)

Division 3rd.

Spanish Oak, (*Q. falcata*.)
Black Oak, (*Q. tinctoria*.)
Scarlet Oak, (*Q. coccinea*.)
Red Oak, (*Q. rubra*.)
Scrub Oak, (*Q. catesbaei*.)
Bear Oak, (*Q. ilicifolia*.)

7. LIVE OAK. (*Q. virens*, Ait.)—Well known under this name wherever it exists, and needing no description. It is found along the sea-shore from near Norfolk, Va., to the coast of Texas. It is commonly 40 or 50 feet high, and 1 or 2 feet through the trunk. Of all the Oaks this is most highly prized for ship-building, the timber hardening with age, and being closer grained and more durable than any other. The bark also is excellent for tanning.

8. WILLOW OAK. (*Q. Phellos*, Linn.)—This beautiful tree, remarkable for the narrowness of its leaves, which gives the foliage much the appearance of that of a *Willow*, and by which it is easily recognized at considerable distance, extends north as far as New Jersey. It affects cool moist situations, and is not uncommon on the borders of swamps in the Lower District, where it rises to the height of 50 to 60 feet, with a diameter of 2 feet. In the Middle District it is more scatteringly found in similar situations. It is more to be admired for its beauty than its use, as the wood is very coarse grained, and ill adapted to purposes requiring much strength and durability; though it is said to answer tolerably well, if thoroughly seasoned, for the felloes of wheels.

9. LAUREL OAK. (*Q. laurifolia*, Michx.)—This is a stately tree, of similar dimensions to the preceding, which it somewhat resembles, though the leaves are neither so long nor narrow, and are not always entire. It holds a middle place, in its general appearance and qualities, between the *Willow Oak* and narrow leaved *Water Oak*. The acorns resemble those of the latter. I am not aware that it has any distinctive name in this State, as it seems to be generally confounded with one or other of the species just mentioned. In South-Carolina along a portion of the Pee Dee, it has a local name of *Darlington Oak*. The English name which I have chosen is only a translation of the botanical name. I believe this tree is not found north of this State, but it is common southward to Florida. It is an inhabitant of our Lower and Middle Districts in similar localities with the preceding, but flourishes well in higher and drier grounds, and is a common and much admired shade tree in towns and villages, especially in the lower parts of the State.

10. SHINGLE OAK. (*Q. imbricaria*, Michx.)—This takes the place of the preceding Oak in the Upper District, not being found east of Burke and Wilkes. From thence westward it becomes more abundant along the larger water-courses, especially those which flow to the west, as the Pigeon and Hiwassee. Its northern limit is in western Pennsylvania. It is more common in the Western States, as far north as Illinois, and is there known by the names of *Jack Oak*, *Black Jack Oak*, *Laurel Oak*, and *Shingle Oak*. In those parts of our State where it occurs, I have heard it called only *Water Oak*, a name very generally applied elsewhere to a very different species. This is from 40 to 50 feet high and 12 to 15 inches in

diameter, branches low, and casts a thick shade with its dark crowded foliage. The leaves are 3 or 4 inches long, about 1 inch broad, and of a light shining green. The wood is hard and heavy, but porous, and inferior to that of *Willow Oak*, which it resembles. In Illinois it has been used for shingles, probably for want of a better material. On the Pigeon River I have noticed a few trees with the leaves more or less cut or lobed, which are probably a cross between the *Shingle Oak* and one of the *Red Oaks*, though their whole appearance and habit were, in other respects, those of the former. This is *Q. Leana*, Nutt.

11. UPLAND WILLOW OAK. (*Q. cinerea*, Michx.)—Found only in the Pine barrens of the Lower District, where it is very generally diffused. It rarely exceeds 20 feet in height and 6 inches in diameter, though I have seen it, when standing alone and in favorable situations, quite a large tree with a circumference of 3 feet. As a general thing it may be considered too insignificant to merit more than a passing notice. Its foliage is of an ashy hue. The bark affords a fine yellow dye; but the tree is too small and too little multiplied to furnish material for extensive use. In the vicinity of the Pee Dee River this Oak is called *Blue Jack*.

There is a dwarf variety of this, called *Running Oak* and *White Oak Runners*, (var: *pumila*, Michx.,) which is, I believe, the smallest Oak known. It rarely reaches a height of 3 feet, and bears a profusion of acorns at the height of 15 and 20 inches. The foliage is very similar to that of the preceding, but is smaller and becomes smoother in age. It abounds in creeping roots from which its small stocks spring. It is found only in the Lower District, especially near Wilmington, from whence it is sparingly found in the Barrens as far to the south as Florida.

12. WATER OAK. (*Q. aquatica*, Cates.)—This is not found beyond Maryland. It is abundant in our Lower District, and in some parts of the Middle, on the borders of swamps and in the river bottoms, and extends somewhat into the Upper. It is 40 or 50 feet high, and 12 to 20 inches in diameter. The leaves are pear-shaped, as in the *Black Jack*, being much the broadest at the upper end, but are smaller, smoother and paler green than in that species. The bark is seldom used for tanning. The wood, though very tough, is not much employed for economical purposes, being inferior to oth-

er kinds of Oak. On the Roanoke I have heard this called *Turkey Oak*, a name also given to the *Spanish and Post Oaks*.

The foliage of this tree varies very much in different situations, it being sometimes narrow and very little if at all broader at the upper than at the lower end, so as to resemble very much that of the *Shingle Oak*. But any one who is familiar with the common form and habit of the *Water Oak* will not be easily deceived in its varieties.

13. BLACK JACK. (*Q. nigra*, Linn.)—This small and generally unsightly tree, easily recognized at a distance, when it is of much size, by its lower limbs hanging downwards, sometimes to the very ground, is found as far north as New Jersey and extends into the Western States, as well as southward to Florida. In this State we meet with it in various soils and situations from the coast to the Mountains, seldom exceeding 30 feet in height and 12 inches in diameter. In the largest stocks the wood is heavy and compact, but coarse grained and porous in the smaller ones. When exposed to the weather it is subject to rapid decay, and is not of any value in the arts. For fuel it is among the best wood we have. The leaves are large, (6 to 9 inches long,) of a dark green above, and of a rusty color beneath. On young shoots, as is frequent on other trees, the leaves are often twice their ordinary size, and divided into several segments as in the *Red Oaks*.

We now come to a Division of the Oaks known as that of the *Red Oaks*, in which there is such a confusion of popular names that they will be of little service in designating the species. There is no uniformity in their application in different parts of the State, and within the same neighborhood the same name may be given to different species, or different names to the same species. This is not very surprising, since there is so much resemblance among them, and as there is apparently a tendency to crosses among the members of this Division. It is indeed sometimes rather difficult to determine whether a particular tree belongs to one or other of two or three pretty well marked species. I shall therefore be obliged to describe the following more minutely than I have the preceding, though I shall only notice the most common or typical forms. The names given below are those by which the species are most commonly known in different parts of the United States.

14. SPANISH OAK. (*Q. falcata*, Michx.)—This is generally known in this State, I think, by the name of *Red Oak*, though sometimes called as above. It is also, in some parts, denominated *Turkey Oak*, from a vague resemblance between the form of the leaf (when it has but three divisions,) and the track of a Turkey. It is to be distinguished, even at some distance, from other species of this section by the grayish down on the underside of the leaves and on the young shoots upon which they grow, giving the tree a very different hue from that of the others. The leaves, too, have narrower divisions (3 to 7 in number,) than the others, generally entire, and slightly curved backwards. The manner in which the clusters of leaves hang down from the ends of the branchlets gives them a plume-like aspect very unlike those of the other species.

The Spanish Oak is found as far North as New Jersey, and southward to the Gulf of Mexico. In this State it is one of the commonest forest trees from the coast to the mountains, but diminishes in quantity as we approach the latter. It is often over 80 feet in height with a diameter of 4 to 5 feet. The bark of the trunk is dark-colored, its outer portion (cellular integument) being of moderate thickness. The wood is reddish and coarse-grained with empty pores. The staves made of it are only adapted to contain coarse articles, but are said to be more esteemed in the West Indies than those made from the other *Red Oaks*. The wood is less durable than that of the *White Oaks*, and is not much used in building, &c. The bark is held in high estimation for tanning hides, which it renders whiter and more supple than other species.

A variety of this species (var: *pagodæfolia*, Ell.) has larger leaves, cut into 11 to 13 divisions, gradually diminishing in length from the lower to the upper divisions. Another variety (var: *triloba*, Michx.) has leaves with two or three short and rounded divisions at the outer end, but may always be recognized by the gray down on the underside and its accordance in other respects with the common form.

15. BLACK OAK. (*Q. tinctoria*, Bartr.)—A tree 80 or 90 feet high and 4 or 5 feet in diameter. The trunk has a deeply furrowed dark brown bark, from whence the tree probably gets its name. The leaves are cut rather deeply into 5 or 7 divisions, the divisions being also somewhat toothed, and each part tipped with a bristle. They have also a thin rusty down on the underside. The leaf-stem

is from 1 to 2 inches long. During the spring and part of summer their upper surface is roughened with small glands which are perceptible to the sight and touch. On young stocks they turn dull red in the Fall; those on old stocks, yellow. When the leaves have fallen, this species may be distinguished from the *Spanish Oak* by the longer, more acute and more scaly buds, and also by chewing a bit of the bark which gives a yellow color to the saliva. The wood is reddish and coarse-grained, with empty pores, but is stronger and more durable than any other of the *Red Oaks*; and where *White Oak* can not be obtained is a good substitute for it in buildings. Staves are largely made of it for containing coarse articles. The bark is very rich in tannin, and is in much request. From this bark is obtained the *Quercitron*, which is extensively used in dyeing wool, calico, silk and paper-hangings. The decoction is brownish yellow, and is made deeper by an alkali, lighter by acids, and brighter by a solution of tin.

This tree is common in the United States east and west of the Alleghanies, reaching north to New England, and is said to indicate a good soil for agriculture. It is most abundant in the upper part of the State. If it exists in the Lower District it must be sparingly.

16. SCARLET OAK. (*Q. coccinea*, Wang.)—This is generally confounded with the preceding species, and called *Spanish* and *Red Oak* in this State. It can be distinguished from the *Black Oak* by the leaves being more deeply cut, the divisions narrower and more widely separated, but especially by their being quite smooth on both sides and of a brighter shining green, turning bright scarlet after frost. The leaf-stem is also more slender and twice as long as in the *Black Oak*. The kernel of the acorn seems also to supply a uniform character of distinction—that of the *Scarlet Oak* being *white*, and of the *Black Oak*, *yellowish*. The bark, when chewed, does not, like that of the *Black Oak*, impart a yellowish tinge to the saliva. The wood is very similar to that of the preceding species, but is not very durable, and is not used for building, &c., when better material can be had. What is known as *Red Oak Staves* are made from this as well as from the two preceding species. The bark is much inferior for tanning to that of the *Black Oak*.

This tree ranges from New England to Georgia and Florida. In this State it abounds chiefly in the Middle and Upper Districts, it not being generally diffused in the Lower.

17. RED OAK. (*Q. rubra*, Linn.)—This, like the preceding species, is sometimes called *Spanish Oak*, though it is as strongly marked a tree as can be found in our forests. The leaves are larger (6 to 9 inches long,) than any others in this Division, not so deeply cut, smooth and green on both sides, changing in the Fall to dull red, then to yellow. The acorns in particular furnish a character which at once discriminates this from all the *Red Oaks*, they being of larger size (1 inch long,) and having very *flat shallow cups*. The wood is reddish and coarse grained, and the pores very large. It is strong but not durable, and is much inferior to the other *Red Oaks*, though staves are sometimes made of it. The bark is inferior for tanning to that of the *Black* or *Scarlet Oak*.

This tree extends farther north than any other of our Oaks, reaching into Canada. It is tall and wide spreading, sometimes over 80 feet high, and 3 or 4 feet in diameter. For its full development it requires a cool and fertile situation, and hence abounds more in the interior parts of the State. In the Lower District it is found but sparingly.

18. SCRUB OAK. (*Q. Catesbæi*, Michx.)—This grows only in the sandy *barrens* of the Lower District, but may be found from the coast westward to the counties of Richmond and Moore. I am not aware of its existence north of this State, but it is found southward to Florida. It seldom exceeds a height of 25 feet, and is most commonly from 10 to 15 feet high. Among the *Red Oaks* this species is easily recognized, not only by its situation and humble size, but by the very *short leaf-stem*. In this last particular, as well as in its habit, and in the color, texture and weight, of the wood, it has a close relation to the *Black Jack*; and in South-Carolina is called *Forked-leaf Black Jack*. Indeed, when the leaves are fallen, the two are rather difficult to be distinguished. For fuel they hold about the same rank. The bark is said to be valuable for tanning, but is too scanty to be much used.

19. BEAR OAK. (*Q. ilicifolia*, Wang.)—A shrub, ordinarily about 3 or 5 feet high, extending from New York southward through the mountains of Virginia (where it is common,) and North-Carolina (very rare,) to Georgia. The leaves are 2 or 3 inches long, cut about half way to the middle nerve into two divisions on each side, and with a white down on the underside. Worthless in itself, but a good indicator of barren soil.

HICKORIES.

The general qualities of the wood of these species are so similar, that, to avoid repetition, they may as well be indicated here, so far as they belong to the whole genus or to any of its Divisions. For weight, strength, and tenacity of fibre, we have no wood superior; but its value is impaired by a tendency to rapid decay on exposure, and its peculiar liability to injury from worms. Hence it cannot be used in buildings. But the wood of the different species is indiscriminately used for axel trees, axe-handles, carpenter's tools, screws, cogs of mill wheels, the frames of chairs, whip handles, musket stocks, rake teeth, flails, &c., &c. For hoops we have nothing equal to it. These are made from young stocks. For fuel, there is no wood which gives such intense heat and heavy long-lived coals. For this use, although discrimination is seldom made, the *Common Hickory*s, is said to be the best, and the *Bitternut Hickory* the poorest. For timber, *Shell Bark* and *Pignut Hickories* are reputed the best.

It is to be observed upon this genus of trees, that the species are subject to considerable variation both in foliage and fruit,—sometimes apparently from crosses, as well as from difference of situation,—and hence are very difficult of discrimination without long and patient attention. This I have not given them, and am therefore unable to indicate any thing like an accurate range of the species enumerated below, which have been carefully examined only in particular localities.

The Hickories are peculiar to North America, of which we have 9 species. In this State I have seen but six, though I give seven in the following list. The species are very naturally arranged in three Divisions. The first Division is characterized by the husk falling away from the Nut in four entire pieces, and the bark of the old trunk peeling off in long flakes or plates. These are the *Shell Barks* or *Shag Barks*. The second has a husk which does not divide down to its base, and the bark of the trunk is not shaggy. These two, especially the first, have Nuts with a sweet eatable kernel. The third Division has Nuts with a thin shell and husk, and an astringent bitter kernel.

Division 1st.

Shell-bark Hickory, (*Carya alba*.)
Thick Shell-bark Hickory, (*C. sulcata*.)

Division 2nd.

Common Hickory, (*C. tomentosa*.)
Pignut Hickory, (*C. glabra*.)
Small-nut Hickory, (*C. microcarpa*.)

Division 3rd.

Bitter-nut Hickory, (*C. amara*.)
Water Bitter-nut do., (*C. aquatica*.)

1. SHELL-BARK HICKORY. (*Carya alba*, Nutt.)—This is not abundant in any part of the State, and least of all in the Lower District. It grows upon the rich lands on and near water courses. It is much more common in the Northern States than in the Southern. It is 60 or 80 feet high, with a disproportionate diameter of 15 to 20 inches for three fourths of its length. The narrow strips of outer bark loosened from the trunk, attached only by the middle, while the two ends are bowed outwards, which characterize this and the next species, are observable only on stocks that exceed 10 inches in diameter and are 8 or 10 years old. But the leaflets are almost uniformly in two pairs (rarely three) with an odd one at the end of the common leaf-stem. The Nuts are nearly pointless, and with a thin white shell. They are the finest nuts we have, excepting perhaps the *Pecan Nut* (*C. oliveiformis*), of the South-western States.

2. THICK SHELL-BARK HICKORY. (*C. sulcata*, Nutt.)—Most common in the Middle and Western States. I have not met with it in this State, and it is introduced here on the authority of others. It may be looked for only in the extreme western part of the State, especially along the rivers flowing westward.

This may be distinguished from the preceding species by its *three* pairs (sometimes four,) of leaflets on the common leaf-stem, and by the *thick yellowish* shell of the nut, which is also ribbed on its upper half, and has a strong point. The kernel is smaller, and hardly so sweet as in the preceding.

3. COMMON HICKORY. (*C. tomentosa*, Nutt.)—Found in all the States and common in our own forests from the coast to the mountains, the only one which occurs in the barrens. All the Hickories are generally characteristic of a good soil, and this is no exception only when it grows in the barrens, as it is most vigorous in rich soils. It is about 60 feet high and 18 or 20 inches in diameter.

This species is white to the heart, for which reason, probably, it is called *White Hickory* in some parts of the State. The other species have their wood more or less reddish. The leaflets are from 7 to 9, (generally 7.) The fruit has a thick husk, splitting nearly to the base. The nut is of various forms, but is somewhat 6-angled, of a light brown color, with a very thick shell and small kernel.

4. **PIG-NUT HICKORY.** (*C. glabra*, Torr.)—Found in most of the States; it is 70 or 80 feet high, scatteringly disseminated among the other Hickories throughout North-Carolina. It can be distinguished in winter by the shoots of the preceding summer, which are brown, and not half the size of those of the preceding species. These are exceedingly tough and of the best quality for *Hickory withes*. The leaflets are smooth on both sides, 5 to 7 in number. The fruit is generally pear-shaped, the husk thin and green, the shell of the nut very hard and smooth, and the kernel small and sweetish.

5. **SMALL-NUT HICKORY.** (*C. microcarpa*, Nutt.)—This is more common in the northern States than with us. I have observed it only in Caldwell county, though it probably exists in most of the western counties, intermingled with the *Common Hickory*. It is of similar dimensions with the latter, but the bark of the trunk is much more even. The foliage is much like that of the *Pig-nut*. The nut is roundish, not much larger than a nutmeg, with a thin shell.

6. **BITTER-NUT HICKORY.** (*C. amara*, Nutt.)—Not uncommon from the coast to the mountains, preferring rich and cool soils, where it rises to the height of 70 or 80 feet with a diameter of two or more. It is sometimes called *Swamp Hickory*. The foliage appears later than that of the other species. The leaflets are 7 to 11 and smooth. It can be recognized in winter by its small yellow buds. The fruit has a thin husk which has prominent seams opening about half way to the base, and a nut with a thin shell that can be crushed with the fingers. The kernel is excessively bitter and astringent, not likely to be forgotten by any who have eaten it. The timber is inferior to that of the others.

7. **WATER BITTER-NUT HICKORY.** (*C. aquatica*, Nutt.)—This is 40 to 50 feet high, found only in the swamps and river bottoms from North-Carolina southward. It is generally confounded with the preceding, from which it can be distinguished at some distance by the more numerous (9 to 13) and more slender leaflets, which

are shaped very much like the leaves of the Peach, though larger. Fruit with a thin husk parted nearly to the base; a nut with thin shell and of a reddish color, and the kernels bitter as in the preceding. The timber is rather inferior, even to that of No. 6.

WALNUTS.

1. BLACK WALNUT. (*Juglans nigra*, Linn.)—This tree is well known throughout the State by this name, and needs no particular description. With us it is 40 or 50 feet high; but in the richer lands of the Western States it is often 70 feet, with a diameter of 6 and 7. It is most abundant in our Middle District. The timber is much used in cabinet work, is of a dark brown color, strong and tenacious, the grain fine and compact enough for receiving a polish, and when well seasoned does not warp and split. It is also exempt from attacks of worms. The Nut is globular, and its kernel sweet and agreeable to most persons, though inferior to the European Walnut (*J. regia*.) The young fruit is highly esteemed for Pickles and Catsup. The husk is employed in domestic use for dyeing Woollens. This is a pleasant shade-tree, and mingles well with others about a residence.

2. WHITE WALNUT. (*J. cinerea*, Linn.)—This is the common name of the tree in the section of State where it grows, though that of *Butternut*, applied to it in the Northern States, is not unknown. It is found upon bottom lands and river banks in the vallies of the Mountains. I have not met with it east of Wilkes, but am informed that it is occasionally found as far down the country as Orange and Randolph. Its general aspect is very much that of the *Black Walnut*, but it is a smaller tree, and when in fruit can be at once recognized by the Nuts, which are about twice as long as broad. When not in fruit, the pitchy clamminess of the leaf-stems and young branchlets, together with the smooth gray bark of the branches, will readily distinguish it. In favorable localities at the North, this tree attains the height of 50 feet, with a diameter of 3 or more; but with us it is rather smaller. The timber is of a reddish hue, not of much strength, but durable and free from attacks of worms. It is used in light cabinet work and in the panels of carriages, as it is light, not liable to split, and receives paint remarkably well. It is also used somewhat in the lower frame-work

of buildings and for the various purposes in rural economy which require material not easily affected by heat and moisture. The bark is sometimes used for dyeing Woollens a dark brown, though not equal for this purpose to that of *Black Walnut*. It is also a domestic remedy for cases where a sure but safe and gentle cathartic is needed. The kernel of the Nut is more oily than in the *Black Walnut*, but is palatable. The young fruit is used for Pickles. The sap of the tree is slightly saccharine, and sugar has been made from it, but not equal to that from the *Maple*.

CHESTNUTS.

1. CHESTNUT. (*Castanea vesca*, Linn.)—This is an inhabitant of all the cooler parts of the United States. With us it is chiefly confined to the mountains from Ashe to Cherokee, and is found but sparingly on hills in the Middle District as low down as Guilford and Randolph. It finds its proper soil and temperature on the sides of our high mountains, where it probably acquires as large dimensions as anywhere in the Union; stocks being sometimes met with which, at 6 feet from the ground, measure 15 or 16 feet in circumference. Its usual height is from 50 to 70 feet, but is sometimes 90, with a capacious and well formed top. The wood is light, tolerably strong, elastic, and capable of resisting the effects of atmospheric changes. Its durability gives it great value for fencing, and the rails, which are split out straight and easily, are said to last 50 years. For shingles it is superior to the *Oaks*, but is liable to warp. It is sometimes used for cooperage, but is too porous for anything but dry wares. For fuel it is little esteemed, as it *snaps* most intolerably, almost as much as *Hemlock Spruce*. But for charcoal it is well adapted, and in this form is extensively used in Forges and Smithies.

Botanists deem our Chestnut to be only a variety of the European. The wood is not quite so fine grained, and the nuts are only about half the size of the European, but they are much sweeter and more palatable. On Mt. Aetna is a Chestnut tree (but apparently of five united trunks,) 53 feet in diameter, and with a spread of branches sufficient to shelter 100 men on horseback! There are several trunks near this which are 75 feet in circumference.

2. CHINQUAPIN. (*C. pumila*, Michx.)—This extends from the Delaware throughout the South. In this State it is known from the seaboard to Cherokee, and in great varieties of soil. It is usually a shrub from 6 to 12 feet high, but in cool fertile situations it is sometimes 30 or 40, and 12 or 18 inches in diameter. The wood is finer grained than the Chestnut and equally durable; but the stock is too small for extensive use.

There is a distinct variety of this (var: *nana*), in our poor forests with slender shoots and extensive runners, bearing fruit at the height of a foot.

BEECH. (*Fagus ferruginea*, Ait.)—Common throughout the United States, and the only species in the country. It is a very handsome tree, though rarely seen in cultivation. In the Lower District of the State it occurs rather sparingly and of no great size. In the Middle District it is more common and luxuriant; but it is in the Mountains that it is found in greatest abundance and of proper dimensions, being there from 50 to 80 and even 100 feet high, with a diameter of 2 and 3 feet. The wood is compact and tough, and of very uniform texture, by which it is well adapted for plane-stocks, shoe-last, and the handles of mechanical implements. When perfectly seasoned, it is not liable to warp. It is easily affected by variations of moisture and dryness, but is very durable when kept constantly dry, or when permanently immersed in water. The bark is sometimes used for tanning, but is not equal to that of *Oak*. The nuts are a fine mast for hogs, and a valuable oil can be expressed from them.

The old Saxon word for Beech is *Buch* or *Buck*, and hence our word *Buckwheat* (i. e. Beechwheat) from the similarity of their triangular fruit.

BUCKEYES.

These handsome productions, admired both for their foliage and blossoms, as well as for general elegance of form, are of the same genus with the Asiatic *Horse Chestnut* (*Æ. Hippocastanum*), so much prized as an ornamental tree in Europe and parts of this country. The leaves are what is called *digitate*; i. e. the leaflets spread, like the fingers of a hand, from the end of a common leaf-stem, a character which belongs to no other of our forest trees.

There are 4 species in the United States, of which two are native within our limits. Possibly a third species (*Æ. parviflora*,) exists in the upper part of the State adjoining South-Carolina and Géorgia.

1. **YELLOW BUCKEYE.** (*Æsculus flava*, Ait.)—More abundant in the Western than in the Atlantic States; in the latter it is not found north of Virginia. In this State it is most abundant upon the sides of our high mountains, and is nowhere of larger size. It here reaches a height of 60 and 80 feet, with a diameter of 3 or 4, and with its tapering straight trunk is a very imposing tree. There is no better indicator than this of a deep rich fertile soil. The flowers are in large clusters, yellow, (or occasionally with a reddish tinge,) and very showy. In the Middle District this species is found along streams and in river bottoms as far down as Orange, but is here a mere shrub 3 to 6 feet high.

2. **RED BUCKEYE.** (*Æ Pavia*, Linn.)—This grows only in the Southern and Western States. It is distinguished by its dull red flowers, and is what is chiefly known in our Lower and Middle Districts under the name of *Buckeye*. It is usually 8 to 12 feet high, but sometimes becomes a small tree. The root of this species is sometimes used as a substitute for soap in washing woollen cloths. The powdered seeds and bruised branches, if thrown into small ponds and stirred a while, will so intoxicate fish that they rise to the surface and may be taken by hand.

The next Group of trees is that whose fruit is contained in Pods, or seed-vessels which are longer than broad, like those of the Bean and Pea. It includes the *Locust*, *Red Bud*, &c.

1. **LOCUST.** (*Robinia Pseudacacia*, Linn.)—In the Atlantic States this well known ornamental tree first appears in southern Pennsylvania and extends thence along the Alleghanies to their southern terminus. It is more common in the Western States. In North Carolina I have met with it in a wild state only on the lower ridges of the Mountains, but probably it is, or was, native for some distance east of the Blue Ridge. The wood is hard, compact, and takes a high polish. It resists decay longer than almost any other, and hence is exceedingly valuable for posts and fences. There are differences, however, in the quality of the trees which it is important to keep in mind. Those with a *red heart* are deemed the best;—those with a *greenish-yellow heart*, the next,—and those

with a *white heart*, the least valuable. In Civil Architecture the timber is not extensively used in buildings, but is employed for Railroad ties and sleepers, whenever it can be had. In Naval Architecture it is used to as great an extent as the supply will permit. For trunnels (the wooden pins that fasten the planks to the frame of vessels,) it is of the highest value, as, instead of decaying, it grows harder with age. The wood is also used by Turners instead of *Box*, for the manufacture of small articles, such as bowls, salad spoons, &c., for which it is well adapted by its hardness, durability, and capability of polish.

2. CLAMMY LOCUST. (*R. viscosa*, Vent.)—A very ornamental tree, smaller than the foregoing and much less known, it being chiefly confined to the southern range of our Mountains and the adjoining ones in South Carolina and Georgia. It does not exceed 40 feet in height. The young branches are covered with a clammy matter, and the flowers are of a beautiful rose color; characters which will always distinguish it from the preceding. The wood is similar.

3. ROSE LOCUST. (*R. hispida*, Linn.)—A well known ornamental shrub of our gardens, (sometimes known by the singular misnomer of *Rose of Sharon*,) with large deep rose-colored blossoms, bristly branches, flower-stems and pods. It is indigenous to the rocky summits of mountains and hills in the Upper and Middle Districts; and a dwarf variety, in the Pine barrens of the Lower.

HONEY LOCUST. (*Gleditschia triacanthos*, Linn.)—Found in all the States from Pennsylvania and Illinois southward. It is diffused over this State, but is nowhere very abundant. It is from 30 to 50 feet high, and 2 or 3 feet through. The heart much resembles that of *Locust*, but is coarser, and the pores are quite open like those of *Red Oak*. It is therefore used only where other material can not be conveniently had. The large pods, 12 or 18 inches long, contain a sweet pulp from which a very palatable beer is made. This thorny tree has been occasionally employed for hedges, but, in all the cases I have seen, without success, the stocks having all run up into trees, possibly from not having been kept down by persevering attention to cutting in.

RED BUD. (*Cercis Canadensis*, Linn.)—Common over the United States, and found in the Lower and Middle Districts of this, most abundantly in the latter. It is from 15 to 25 feet high, but when the main stock is cut generally shoots up into a cluster of shrubs. As it blossoms early, before the development of its leaves, and is covered with a profusion of bright purplish-red flowers, it is a very striking object in the forests in early Spring.

CATALPA. (*Catalpa bignonioides*, Walt.)—This is so common around settlements as to merit a passing notice, though it is nowhere native in the Atlantic States north of the Savannah River. Further south and at the west it is not an uncommon forest tree near rivers, especially those that empty into the Mississippi.

KENTUCKY COFFEE TREE. (*Gymnocladus Canadensis*, Lam.)—A native of the Western States, but occasionally cultivated about houses as a handsome shade tree in our Middle Districts and spontaneously multiplying from the seeds. It has a general aspect like that of *Locust*, for which it is often mistaken. The pods are thick shelled, 6 to 10 inches long and 2 broad, containing seeds $\frac{1}{2}$ inch broad.

The next GROUP comprises trees with a flat winged fruit, as the Maple, Ash and Elm.

MAPLES.

These are stately and beautiful trees, as much prized for ornament as for their value in art. We have five species of Maple, all that are known in the United States, two of which are mere shrubs.

1. **RED MAPLE.** (*Acer rubrum*, Linn.)—Well known throughout the State, being found in swamps and low grounds from the coast to the Mountains. It is among the first trees to throw out its blossoms in early Spring, (as early as February in the Lower District,) and with its bright scarlet flowers then gives a peculiarly pleasing aspect to the otherwise naked forest. In Autumn, the brilliant crimson of its dying foliage again makes it a conspicuous object, though accompanied by others which vie with it in contributing to

the splendor of our autumnal scenery. It does not appear to be so large here as farther north, where it is sometimes 70 feet high and 3 or 4 feet through. The wood is of close and fine grain, and susceptible of brilliant polish. It is extensively used in the manufacture of chairs, saddle trees, yokes, and various articles of wooden ware. It is not sufficiently solid, however, for heavy work, and speedily decays if subjected to variations of heat and moisture. When the grain of this wood has a winding direction, it furnishes the material called *Curly Maple*, which is much used for cabinet work and sometimes for the mouldings of houses. Bedsteads and gunstocks of much beauty are made of it, and it is sometimes employed for inlaying Mahogany. The varied effects of light and shade upon the tortuous veins can be much enhanced by rubbing with sulphuric acid, and afterwards with Linseed oil. The bark of this tree is said to afford a dark blue dye, and a good black Ink. The sap is somewhat saccharine, but is rarely used for making sugar. This tree in some situations has yellowish flowers and fruit, and is then called *Yellow Maple*.

2. WHITE OR SILVER MAPLE. (*A. dasycarpum*, Ehrh.)—This is generally confounded with the foregoing, but is a much rarer tree, in this State. I do not remember to have seen it except in the Mountains. It is 30 to 50 feet high and 1 or 2 in diameter; though in the Western States sometimes 8 or 9 feet through. The top is more spreading than in the *Red Maple*. The leaves are bright green above, and of a silvery whiteness beneath, which gives a pleasing effect to their play in the sunlight, and helps to render the tree a desirable addition to ornamented grounds. The flowers are greenish-yellow, and the fruit (woolly when young,) has large spreading wings. The wood is very white and fine grained, but much softer than in the other Maples; and hence is little used in cabinet work where the others can be had. The sap is sometimes converted into Sugar, which is of superior whiteness and flavor to that of the *Sugar Maple*; but twice the quantity of sap is required to give an equal quantity of Sugar.

3. SUGAR MAPLE. (*A. saccharinum*, Wang.)—This is found from Canada to Georgia, and is the most interesting and valuable of our Maples. It has a height of 50 to 80 feet, a diameter of 2 and 3, and a very symmetrical oval top of compact branches, which make it one of the most desirable trees for streets and avenues. It is

very abundant in our mountains, and occurs also in the Middle and Lower Districts. The wood is white when freshly cut, but becomes of a faint rosy hue on exposure. It has a fine close grain, takes a fine polish, and is heavy and strong. It is not as durable as Oak, and is not much used in Civil or Naval Architecture. When well seasoned, it serves for axles and spokes of wheels, chairs, &c. This tree produces a curled variety of wood like the *Red Maple*. But there is yet another and more beautiful variety, called *Bird's Eye*, which is much used for ornamental wood work. The wood makes excellent fuel. The ashes abound in Alkali, and they furnish the largest part of the Potash shipped from northern ports.

It is the production of Sugar from the sap of this tree, which gives it its highest value. In some of the Northern States, particularly in Vermont, it is made to an extent that constitutes them almost as much a Sugar producing country as Louisiana. In our Mountains, which are too remote from a market to permit any effort to produce this article in sufficient quantity, and of suitable quality, for purposes of commerce, it is annually made to some extent for home use, but not enough for the "sweetening" required even in the Mountains. It is only in the colder regions that the tree can be used for this purpose. In our low country Sugar cannot be made from it.

4. STRIPED MAPLE. (*A. Pennsylvanicum*, Linn.)—This grows in the colder parts of the country from Canada to Georgia, and is known under the names, besides the one already given, of *Moosewood* and *Striped Dogwood*. In North-Carolina it is confined to the Mountains. It is but a shrub, rarely over 10 feet high. The bark is smooth and green, with longitudinal dark stripes, which distinguishes it at all seasons, and makes it an object of some curiosity and interest in shrubberies. The fruit is like that of other Maples, and of greenish color.

5. MOUNTAIN MAPLE. (*A. spicatum*, Lam.)—This has nearly the same range in the country with the preceding one. In this State it is found only in the Mountains, and is also a shrub 6 to 10 feet high. From its insignificance it does not seem to have attracted sufficient attention to acquire a popular name; but is known farther north by the above, and also as *Low Maple*. Europeans, who have paid far more attention than ourselves to the uses and ca-

pacities of our forest productions, have ascertained that this and the *Striped Maple* acquire double their natural size, when engrafted on other species of Maple. Its leaves and fruit have the common characters of a Maple, the latter being rather small.

ASH-LEAVED MAPLE. (*Negundo aceroides*, Mœnch.)—I have not learned the name by which this is known in North-Carolina, and have adopted the one very appropriately used in other parts of the United States. In the Western States, where it is more common, it is called *Bow Elder*. In South-Carolina I have heard it called *Stinking Ash*. It has the leaves of an *Ash*, and the fruit of a *Maple*. It is rare in the Lower District, but is common on the borders of streams in the Middle District to the Mountains.

Its ordinary height is from 15 to 25 feet, a rather handsome tree, of light green branches and trunk, and the bark of rather disagreeable odor. The wood, though fine grained, is not much used, as it is liable to rapid decay. In the West, it is sometimes employed for inlaying furniture made of Mahogany and Cherry.

ASHES.

This is a genus of handsome trees, and next to the Oaks, furnishes the most valuable timber of our forests. The distinguishing properties of the wood are strength and elasticity. The species have a great similarity of general aspect, and are subject to considerable variation in different soils, so that their discrimination requires some attention and experience. In this State they are all called simply *Ash*, without any discriminating adjuncts, and I have not the advantage of names, therefore, to assist me in pointing out the species. None of them are very abundant.

1. WATER ASH. (*Fraxinus platycarpa*, Michx.)—This is a Southern species, peculiar to the marshy borders of creeks and rivers in the Lower Districts, and where, as far as I have learned, there is no other species. It is the only one in the State in which the wings of the fruit extend down to the bottom of the seed, and is sometimes even three-winged. The locality and the fruit will therefore readily determine this species. The tree is 30 or 40 feet high, its timber probably less valuable than some of the others, though partaking of the same general qualities.

2. GREEN ASH. (*F. viridis*, Michx.)—I have seen this only in the Middle and Upper Districts, upon the banks of rivers. The fruit is gradually dilated from the base upward. The leaflets (5 to 9) are more or less toothed, smooth and green on both sides. This is a middle sized tree, with greenish branchlets. The timber is much like that of the others, but hardly equal to *White Ash*.

3. RED ASH. (*F. pubescens*, Lam.)—I have seen this only in Lincoln, but it is doubtless an inhabitant of rich swampy grounds in other counties of the Middle District. It is 50 or 60 feet high, the underside of the leaves, and also the young shoots, clothed with a thick whitish down, which changes, in the Fall, to a reddish tint, from whence is probably derived its common name. The leaflets (7 to 9) are but slightly notched. The fruit is very much like that of the *Green Ash*. The wood is redder than in the *White Ash*, is harder and less elastic, but used for the same purposes.

4. WHITE ASH. (*F. Americana*, Linn.)—Diffused through the United States. With us it is not very abundant, but occurs along streams and the borders of low grounds in the Middle and Upper Districts. It is 50 to 70 or 80 feet high, and 2 or 3 feet through. It has a straight trunk, with grayish furrowed bark, and smooth bluish-gray branchlets and shoots. The leaflets, in Summer, are very smooth, of a light green above and whitish beneath, very slightly toothed on the edges. The fruit is about $1\frac{1}{2}$ inch long, narrow, and with a long slender base, the wing springing from near the summit of the seed. The heart-wood is reddish, and is considered superior to the other Ashes in strength and elasticity. For all the purposes which require these properties, it is employed by Carriage makers, Wheelwrights, Shipwrights, Turners, and Coopers. There are but few trees of the American forests more valuable and more extensively used than this. It is withal a very showy tree in private grounds.

ELMS.

A genus of Trees too well known to need a particular specification of their characters. The fruit is small, flat, and with a thin winged margin.

1. ELM. (*Ulmus Americana*, Linn.)—This magnificent shade tree is well known throughout the country. In the most favorable

situations with us, it is not often seen above 60 or 70 feet high; but in some sections, as in the Middle States, it reaches the height of 100 feet, and a diameter of 4 or 5 feet. The timber of this tree is not in much demand, but is occasionally used by Wheelwrights for the naves of wheels, where other material can not be obtained.

There is a difference in the spread of this tree, the form with drooping branches being much more graceful and showy than the one with more erect branches. It is much to be regretted, that this is generally so crowded in our streets as to prevent its attaining its widest spread, and its most natural and attractive form.

2. SMALL-LEAVED ELM. (*U. alata*, Michx.)—Generally known in this State by this name, but more commonly known elsewhere, perhaps, as *Wahoo*. It is not uncommon with us, except on the higher Mountains. Its Northern limit is in lower Virginia. It is only 30 to 45 feet high, not only smaller, but of much less graceful form, than the preceding, though often seen as a shade tree in our streets. It is readily distinguished by its much smaller leaves, and by the corky excrescences which, as in the *Sweet Gum*, wing the smaller branches.

The wood is more compact and finer grained than in the former species, and is used for the naves of wheels, for which some prefer it to *Black Gum*.

A variety of this occurs, in which the excrescences are wanting, and the branches more slender and flowing. The small leaves, however, determine the species.

3. SLIPPERY ELM. (*U. fulva*, Michx.)—Widely diffused over North America, but in no localities so abundant as either of the preceding. It is occasionally met with in our Lower District, but more frequently in the Middle, and to some extent in the Upper. It is from 30 to 50 feet high, and 12 or 18 inches through. The wood is coarser than that of the other species, but is stronger and more durable, when exposed to the weather, than the common Elm, and is sometimes used in the Western States in buildings and vessels. For ship blocks it is said to be of the highest value. As the trunk splits well, it is convenient for the making of rails, which are very durable. The inner bark of this tree, especially of the branches, contains a large amount of mucilage which is serviceable in colds and bronchial affections, and for emollient plasters.

The next GROUP comprises those trees which have a fruit more or less *fleshy*, whether *stone fruit* like Plums and Cherries, or those which contain seeds like the Crab Apple, and those smaller forms which would popularly be called *Berries*.

1. RED PLUM. (*Prunus Americana*, Marsh.)—A small tree or shrub not uncommon from Canada to Louisiana; and in this State from the coast to Cherokee, especially in the Upper District, along streams and on the border of woods. The leaves are quite veiny and coarsely toothed. The fruit is red, orange or yellow, with a rather tough skin, generally acerb and uneatable, but occasionally of good flavor and then makes an excellent preserve. Some very good varieties have been produced by cultivation.

2. CHICKASAW PLUM. (*P. Chicasa*, Michx.)—A shrub very common in old fields and about settlements throughout the State, sometimes becoming a small tree. It has every appearance of being an introduced plant, and it was a tradition of the Indians that they brought this fruit from beyond the Mississippi, where it is now known to be indigenous. The leaves are smooth, not very veiny, and finely toothed. The fruit varies very much both in color and flavor, but generally quite pleasant, and is much improved by cultivation.

3. SLOE. (*P. spinosa*, Linn?)—I have seen this only in Lincoln county, where it was pointed out to me by Dr. Hunter, and called by the above name. As I have no notes upon this small tree, I am now in uncertainty whether it be identical with the English *Sloe* or *Blackthorn*, which is naturalized in some parts of the country, and is considered by the best Botanists to be the parent of the common cultivated Plum, (*P. domestica*, Linn.)

4. WILD CHERRY. (*P. serotina*, Ehrh.)—This ranks among the largest and finest trees of the American forest, and is very widely diffused through the United States. In this State it is found through all the Districts, but is less common in the Lower, where the soil and climate are not so favorable to its growth. It is on the rich and cool declivities of our mountains that it acquires its full dimensions and attains a height of 60 or 80 feet and a diameter of 2 or 3 feet. The smooth straight shaft, symmetrical summit, bright green leaves and profuse spikes of white flowers, give it a character of much beauty. The fruit is nearly black, (from which the tree is often called *Black Cherry*), slightly bitter, but with a pleasant

vinous flavor, and was formerly much used as a cordial in spirituous infusion. The wood is of a light red tint which deepens with age, is compact and fine grained, and not liable to warp when properly seasoned. If selected from the part of the trunk near the branches, it is almost equal to Mahogany in appearance. It was once extensively used in nearly all kinds of Cabinet work, but has been pretty much superseded by Mahogany and Rosewood. The bark of this tree is a valuable tonic, and forms the basis of some quack medicines.

5. WILD RED CHERRY. (*P. Pennsylvanica*, Linn.)—Chiefly found at the North, but within our limits grows sparingly upon Black, Grandfather, and a few others of our highest mountains. I have but once heard it designated by any distinctive name, viz: *Macnoly*, which may possibly be a corruption of *Magnolia*, and so a misapplication. It is 20 or 30 feet high. The flowers grow in clusters from lateral buds, and not in racemes from the end of the branchlets as in the preceding. The fruit is small and red, with a thin sour flesh. The bark of the trunk is a light red. The wood is reddish and fine grained, but the tree is too small to admit of much use.

6. MOCK ORANGE. (*P. Caroliniana*, Ait.)—This much admired species is confined to the neighborhood of the Ocean, and is not native, I think, much if any, north of the Cape Fear. From thence southward it is rather common along the Atlantic and Gulf coasts. It is 20 to 30 feet high, in proper soil farther south becoming 40 or 50, with thick oval summit, clothed with *evergreen* leaves and casting a deep shade. The racemes of white flowers (growing from the fork of the leaves) are numerous and showy. The fruit is black, globular, not eatable, and remains all winter on the tree. The wood is rose colored and fine grained, rather brittle, I think, but is not abundant enough to be of use in the arts, and is not superior to others more easily obtained. The chief value of the tree is as an ornament, for which it is very extensively cultivated about houses, either singly or as borders and hedges to private grounds throughout the Lower Districts of the Southern States, thriving very well in sandy soils.

DEVIL WOOD. (*Olea Americana*, Linn.)—This has about the same range with the *Live Oak*, and, like that, is found but a short

distance from the coast. I am not informed of any popular name by which it is designated in this State, and have above given the one appropriated to it farther South. As it is an Olive, it might properly be called *American Olive*. It is commonly about 10 or 15 feet high, but is sometimes 30 and more. The leaves are evergreen, entire, thick and very smooth, and give the tree a very pleasing aspect. The fruit is rather larger than a buckshot, of a bluish-purple color, presenting a pleasant contrast to the foliage. The flesh is rather thin over a hard stone, and not eatable. The bark is of a whitish green. The wood has a fine grain, and when dry is exceedingly hard, and very difficult to cut or split, which may furnish a clue, perhaps, to the origin of its name. This tree is well worthy of culture. I have seen it in private grounds under the name of *Dahoon Holly*; but the latter is a very different thing, being a true *Holly* or *Ilex*.

The remainder of this Group, with the exception of the Crab Apple and Persimmon, have fruit which would popularly be called *Berries*, and I therefore bring them together, though the first eight succeeding genera would not be so called by Botanists.

1. HOLLY. (*Ilex opaca*, Ait.)—Common south of New York, and well known through the whole of our State. It is 30 or 40 feet high, and 12 or 15 inches in diameter. The wood is heavy, with a fine compact grain, and takes a brilliant polish. When dry it is very hard, and serves well for pulleys, screws, &c. The black lines inlaid in Mahogany furniture are often the dried wood of this tree, intended to simulate Ebony. The berries are purgative, and 15 or 20 of them will produce vomiting. The fine form of this tree, with its evergreen leaves and scarlet berries, gives it much beauty, especially in winter; but it is said to be less attractive than the *European Holly*. For avenues and hedge-rows we have few trees superior to it.

2. DAHOON HOLLY. (*I. Dahoon*, Walt.)—A shrub or small tree from 6 to 25 feet high, growing on the borders of the Pine-barren ponds and swamps of our Low Country, from Virginia to Florida. The leaves are 1 or 2 inches long, $\frac{1}{4}$ to $\frac{1}{2}$ inch wide, entire, or with a few sharp teeth near the upper end, evergreen. The berries are red, as in the *Holly* and *Yopon*, and the plant is well worthy of cultivation.

3. *YOPON*. (*I. Cassine*, Linn.)—An elegant shrub, 10 to 15 feet high, but sometimes rising into a small tree of 20 or 25 feet. Its native place is near salt water, and it is found from Virginia southward, but never far in the interior. Its dark evergreen leaves and bright red berries make it very ornamental in yards and shrubberies. The leaves are small, $\frac{1}{2}$ to 1 inch long, very smooth, and evenly scalloped on the edges with small rounded teeth. In some sections of the Lower District, especially in the region of the Dis-mal Swamp, these are annually dried and used for Tea, which is, however, oppressively sudorific,—at least to one not accustomed to it. The Mate, or Paragnay Tea, of South America, is of the same genus as this, (the *I. Paragnayensis*), but a very different species. Our *Yopon* is the article from which the famous *Black Drink* of the Southern Indians was made. “At a certain time of the year they come down in droves from a distance of some hundred miles to the coast for the leaves of this tree. They make a fire on the ground, and putting a great kettle of water on it, they throw in a large quantity of these leaves, and setting themselves around the fire, from a bowl that holds about a pint they begin drinking large draughts, which in a short time occasions them to vomit easily and freely. Thus they continue drinking and vomiting for the space of two or three days, until they have sufficiently cleansed themselves; and then every one taking a bundle of the tree, they all retire to their habitations.”

4. (*I. decidua*, Walt.)—This and the next three have deciduous leaves, and have not been honored in this State, as far as I know, with popular names. This is common along shaded ravines and branches throughout the Middle District, and is from 6 to 15 feet high. The leaves are 1 or 2 inches long, with rounded teeth on the edges, narrow and tapering down into a short stem, somewhat hairy on the veins of the underside, otherwise smooth. Berries red, in clusters, each containing 4 to 6 bony seeds, that are ribbed on the back.

5. (*I. ambigua*, Chapm.)—A shrub or small tree confined to our Mountain region in this State, though found elsewhere to the North and South, and from 8 to 20 feet high. The leaves are 3 to 5 and sometimes 6 inches long, about half as broad, with fine sharp teeth on the edges, smooth on both sides, and tapering at the upper end. The berries are red, not in clusters, and with seeds as in No. 4.

6. (*I. verticillata*, Gray.)—This occurs in all the Districts, and in various soils, 2 to 10 feet high, and has clusters of bright scarlet berries which hang on through the Winter. In some States it is called *Winterberry*. The leaves are about 2 inches long, of varying width, but generally broader toward the upper end, coarsely toothed, paler and somewhat downy on the underside. The seeds are smooth and even. A decoction of the bark is a popular application to old sores.

7. GALLBERRY. (*I. glabra*, Gray.)—This and the next species are evergreen shrubs, indiscriminately called by the above name, sometimes *Galls*, more rarely *Inkberries*, names apparently derived from their black bitter berries. This is from 3 to 5 feet high, very common in the Branch swamps of the Lower District, and giving its name of Galls or Gall-bays to the low places chiefly occupied by it. The leaves are very smooth and green, sparingly toothed, 1 to 1½ inch long, and about half that width.

8. TALL GALLBERRY. (*I. coriacea*, Chapm.)—This grows in similar situations with the preceding, having the same habit and appearance, but full twice as large, the leaves also much larger, and either entire or with scattered sharp teeth.

1. Dogwood. (*Cornus florida*, Linn.)—Common throughout the United States, and mostly known by this name, but sometimes called *Boxwood*. From the showiness of its flowers, and the value of its wood and bark, it possesses considerable interest. Its usual height is from 12 to 20 feet, but is sometimes 30 and 35. The wood is heavy, hard and fine grained, and takes a fine polish. Pieces can not be had of sufficient size for large work; but for the smaller sorts of mechanical and agricultural implements, such as cogs of mill wheels, harrow teeth, mallets, wedges, hames, &c., the well seasoned wood is well adapted and much used. The young shoots are used for light hoops. The inner bark is an excellent substitute for Peruvian Bark in intermittent fevers. The fresh article is apt to produce pain, which can be prevented, however, by mixing it with Virginia Snake Root. After being dried for a year, this precaution is unnecessary. A very good Ink can be made of this bark in place of Galls. A pretty variety of this tree with reddish flowers is occasionally met with.

2. SWAMP DOGWOOD. (*C. sericea*, Linn.)—This and the remain-

ing species of the genus are only shrubs, but are placed here for the purpose of having all the species of a genus together, as I have done in other genera. With the exception of the last species, they all have their *leaves opposite*, as in the *Dogwood*. This is the only one of them which has received notice enough in this State, so far as I have discovered, to get a name. It is found in low woods in the Middle and Upper Districts, has purplish branches, is from 6 to 10 feet high, and having rather broad, pointed, leaves, which are smooth above and with a silky down beneath. The flowers are white, in flat-topped clusters, succeeded by pale-blue berries.

3. (*C. stricta*, Linn.)—This is 6 to 15 feet high, with brownish or reddish branches, found only in the wet lands of the Lower District. The leaves are about 3 inches long and 1 inch wide, tapering to a point at the upper end, the edges slightly uneven, smooth on both sides, paler and with prominent veins on the underside. The flowers and pale-blue berries are much as in No. 2.

4. (*C. paniculata*, L'Her.)—A branching shrub, 4 to 8 feet high, with gray branches, found in this State only in our mountain counties. The leaves are only 2 or 3 inches long, with a tapering point, smooth, whitish on the underside. The white flowers are in longer and looser clusters than in the two preceding, and the berries white.

5. (*C. alternifolia*, L'Her.)—I have met with this only on the higher mountains. It is the only one of this genus of *Cornels*—this being the common name of the shrubby *Dogwoods*,—which has the leaves alternating on the branches, instead of being opposite to each other in pairs. It is 10 or 15 and 20 feet high, the branches also alternate, greenish, streaked with white. The leaves are about 3 inches long, hoary and slightly hairy beneath, and pointed at the end. The flowers are whitish in a loose flat topped cluster; the berries dark blue or bluish black.

HACKBERRY. (*Celtis occidentalis*, Linn.)—Common over the United States, sometimes called *Nettle Tree*, and scatteringly found in all parts of North-Carolina. It is occasionally seen as a shade tree in our streets, and is admired by some for its dark green foliage, deep shade and rather graceful branches. The bark of the trunk and larger branches is roughened by small, ridged excrescences. The leaves are about 2 inches long, and rather peculiar

in having one side perceptibly smaller than the other. The berries are about $\frac{1}{4}$ or $\frac{1}{3}$ of an inch in diameter, of a Mahogany color, with a sweetish but thin flesh, enclosing a globular nut. This tree is from 50 to 70 feet high, and 18 or 20 inches in diameter. The wood does not appear to be used for any important purpose.

There is a shrubby form of this (var. *pumila*), occasionally met with in the Lower and Middle Districts, 3 to 10 feet high, and with smaller, thinner leaves, but easily recognised by those who are familiar with the larger form.

1. BLACK GUM. (*Nyssa aquatica*, Linn.)—Common in swamps and shallow ponds of the Lower and Middle Districts, often called *Sour Gum* or *Gum Tree*. It is from 30 to 45 feet high, 12 or 18 inches in diameter. The leaves are 1 or 2 inches long, of a dark green and shining above, and somewhat downy underneath when young. The fruit is commonly in pairs, of a dark blue color, borne on a common stem from $\frac{1}{2}$ to 1 inch long. The wood of this tree has its fibres so interwoven in various directions as to make it nearly impossible to be split, and it is therefore used (especially the yellow variety, known as the *Yellow Gum*.) for the hubs of wheels. It is also employed for making Hatter's blocks, the cogged cylinders in mills for beating rice, and for caps to masts. The roots are in domestic use for large corks, for which, on account of their compressibility and lightness, they answer very well. The crimson hue of the foliage, after frost, of this and the next species, contributes much, with that of the *Red Maple*, *Sassafras*, &c., to give that peculiar brilliancy to our autumnal scenery so often noticed by foreigners.

2. (*N. multiflora*, Wang.)—With us this tree seems to be entirely confounded with the preceding, and is also called *Black* or *Sour Gum*. In some of the States it is also called *Tupelo* or *Pepperidge*. This tree, however, grows mostly in the uplands in rich, generally moist soils, and is larger every way. It is from 30 to 60 feet high, and 1 or 2 feet in diameter. The leaves are 2 to 6 inches long, with a white down underneath, especially when young, rather thick, and shining. The berry is about $\frac{1}{2}$ inch long. The wood is like that of No. 1.

3. CORROX GUM. (*N. uniflora*, Walt.)—This is a Southern tree, having its Northern limit in South-eastern Virginia, and confined

to the deep swamps of the Lower Districts. It is 60 or 80 feet high. The leaves are 5 to 8 inches long, with a few large teeth on the edges, and a soft whitish down underneath. The fruit is an inch or more long, and of a deep blue color. The wood is like that of the two preceding, but is softer, and is indeed the softest wood we have. As it does not split and is very easily worked, it is manufactured into light bowls and trays. The roots are used for making floats to buoy seines, and are a very fair substitute for cork where elasticity is not important.

SASSAFRAS. (*Sassafras officinale*, Nees.)—No plant in the United States is perhaps more extensively diffused than this. In favorable soils it is 40 or 50 feet high, while in poor ground and in the borders of old fields it flowers at the height of 4 to 6 feet. It is common in the Lower and Middle Districts, but is rare in the more elevated parts of the Upper. It is found of largest dimensions in the Middle District. What is known as the *White Sassafras* prevails in the Lower District, the *Red Sassafras* in the others, their differences depending apparently upon a difference of soil. The wood is said to be durable, and is used for fence posts as well as for the rafters and joists of buildings. It is said also to be free from attacks of worms, and that bedsteads made of it are never infested by insects. The roots, and also the flowers, are the basis of some diet drinks which are thought by some to be serviceable to the human system in Spring and Summer. The reputed virtues of the root caused it to become one of the first of our native products introduced into Europe, and ship loads were carried thither in the earlier settlement of this country. The bark of the root is a powerful aromatic stimulant, and has been used in medicine more than 200 years. The young buds and ends of branches contain a good deal of mucilage, and is sometimes used as a substitute for Okra in soups,—where the latter cannot be had.

RED BAY. (*Persea Carolinensis*, Nees.)—This extends from Virginia through the Lower Districts of the Southern States to Louisiana, appearing to be confined to the branch swamps within the range of the Long-leaved Pine. It is a small tree or shrub here, but in the vicinity of the Gulf it reaches a height 50 and 70 feet. The evergreen leaves are 2 to 4 inches long, 1 or more wide, smooth and green above, pale beneath. The shrubby form has the leaves

larger and the underside clothed with a gray down. They have a strong aromatic odor very like that of the European Laurel and may be used in the same manner in cookery and medicine. An aromatic distillation like the Bay Rum of the West Indies could doubtless be obtained from them. The wood is of a beautiful rose color, strong and durable, with a very fine compact grain, and is susceptible of a brilliant polish. Before Mahogany came into such extensive use, articles of furniture of great beauty were made from it at the South, the best having the appearance of watered satin, and they are still found in the houses of some of the older families of the country. I have heard of a single log in Florida sawed into veneering and sold for \$400. In this State it is seldom found of sufficient size for any very important uses.

PALMETTO. (*Sabal Palmetto*, R. & S.)—Cape Hatteras is, or was, the northern limit of this Palm, from whence southward it becomes more abundant in the vicinity of the Ocean. This is the only representative in the United States of a large and remarkable class of trees mostly confined to the Torrid Zone. A trunk 40 or 50 feet in height, of uniform diameter, with a tufted summit of large brilliant green, fan-shaped leaves, and so wholly different in structure and aspect from all our other forest trees is a very noticeable and attractive object on our coast.

The trunk of this tree is of great value in the construction of wharves, as they are not subject to injury from sea-worms. They have been found serviceable in structures for defence, since balls pass with difficulty through the wood as through cork, and the wood closes upon the perforation instead of splitting. The rarity of the tree in this State renders it of little economical importance here. It is to be deeply regretted, however, that a reckless indifference to the future, which has been charged as a characteristic of Americans, is likely to efface, at no very distant time, every vestige of this interesting ornament of our coast. The inner portion of the young plant is very tender and palatable, somewhat resembling the Artichoke and Cabbage in taste, (hence its name of *Cabbage Tree*,) and is often taken for pickling, and the stock is ruined by the process. Thus for a pound or two of pickles, no better either than many other kinds, the growth of half a century is destroyed in a moment, and posterity left to the wretched inheritance of vain

mourning for the loss of the greatest beauty of our maritime forest.

2. DWARF PALMETTO. (*S. Adansonii*, Guerns.)—This is but 3 or 4 feet high, never forming a trunk like the preceding, and found only in the Lower District. The leaves of both these species are employed in the manufacture of Palm-leaf Hats.

PRIDE OF INDIA, OR CHINA TREE. (*Melia Azedarach*, Linn.)—is a common shade tree of streets and yards in the Lower District, and occasionally is seen in the lower part of the Middle District. It is quite naturalized in the former region, to which it is well adapted by its free growth in sandy soil. It is from 25 to 40 feet high, with a spreading top, and its dark green compound leaves and large loose clusters of fragrant lilac-colored flowers make it quite ornamental. The timber is of a reddish hue, and said to be strong and durable; but is seldom used. The leaves pounded and mixed with lard constitute a Persian remedy for a cutaneous disease, better treated, perhaps, with sulphur. The berries are reputed poisonous, as well as most other portions of the tree. Robins feeding upon them in the Spring are so stupefied as to be easily caught.

BUCKTHORN. (*Bumelia lycioides*, Gært.)—A small tree from 15 to 25 feet high, found from North Carolina to Louisiana, rather sparingly in this State from the coast to Lincoln county. Its leaves are entire, smooth on both sides, about 2 inches long and $\frac{3}{4}$ of an inch wide, with short stems. The flowers are whitish and small, growing in a thick cluster in the fork of the leaves, succeeded by a black, cherry-like fruit, about the size of a Pea. The wood is exceedingly hard and heavy, with an irregular grain, and would doubtless be useful for mechanical purposes, were it not too rare to attract much attention.

YELLOW WOOD. (*Symplocos tinctoria*, L'Her.)—Also called *Sweet Leaf* and *High Bush Laurel*. It does not extend much, if any, north of James River. In this State it occurs from the coast to the Mountains, but is most multiplied in the Lower District. In poor soils it is only a shrub 2 to 6 feet high; but in those which are fertile, as on the borders of swamps, it becomes a small tree, 20 or 25 feet high and 6 or 8 inches in diameter. If the trunk be wounded

in Spring, it exudes a milky offensive juice. The leaves, which are 3 to 5 inches long, are sweet to the taste but rather dry, and greedily eaten by cattle and deer in Winter. They afford, by decoction, a beautiful yellow color, which is fixed by a little alum, wherewith cotton, woollen and silk, are dyed. It is not much used however. The fruit is a small one-seeded berry. The wood is soft and valueless.

MAGNOLIAS.

Of this universally and deservedly admired genus there are seven species in the United States, all of which are found within our borders. They all have an aromatic and somewhat bitter bark. The fruit is a fleshy cone, from the cells of which the scarlet berries are expelled and hang for some days by elastic cords. The berries of most become quickly corrupted, but may be preserved for use in damp moss.

1. **MAGNOLIA.** (*Magnolia grandiflora*, Linn.)—I retain the common designation of this tree, though we have six others equally entitled to the name. Farther south it is often called *Big Laurel*. The northern limit of this tree is in Brunswick County, south of the Cape Fear; but it flourishes vigorously in cultivation through all the lower part of the State. Its usual height in the forests is from 50 to 70 feet, but has been found 90 feet high, and has a handsome form. The leaves are 6 to 10 inches long, evergreen, very thick and leathery. The white fragrant flowers, 6 or 8 inches broad, contrasting strongly with the dark green foliage, makes this perhaps the most beautiful tree in the United States. The timber of this tree is soft and very white, but is little used.

2. **SWEET BAY.** (*M. glauca*, Linn.)—The smallest and most widely diffused of our Magnolias, it being common in the maritime districts from Louisiana to New Jersey, and in a single locality north of Boston. In this State it is seen along branches and Bays throughout the Lower District, and in similar situations, though not common, in the Middle District. It is from 12 to 25 and 30 feet high, sometimes flowering at the height of 5 or 6 feet. The leaves are small, the white under-surface contrasting pleasantly with the pale green of the upper. The flowers are 2 or 3 inches broad, pure white, and of powerful but grateful odor.

3. UMBRELLA TREE. (*M. Umbrella*, Lam.)—This is common in the Middle and Western States as well as in the Southern. In this State it is met with in shaded deep rich soils from the coast to Cherokee, and is mostly called *Cucumber Tree*, a name more generally and properly given to the next species. It is from 25 to 35 feet high. The leaves are 18 or 20 inches long, 6 or 7 broad, and acute at each end. The flowers are 7 or 8 inches broad, white, and not of pleasant odor. Though inferior in beauty to some others, it is an ornamental tree and deserving of cultivation.

4. CUCUMBER TREE. (*M. acuminata*, Linn.)—This seems to be universally known by the name here given, and is so designated from the form of its cone or fruit, which, in this species, is narrower than in the others, and when green is not unlike a cucumber about 3 inches long. The tree is found from the Northern Lakes to the mountains of Georgia. In this State it grows only on the mountains, particularly of Ashe, Yancey and Burke, in moist fertile soil of declivities and on the banks of torrents. It is from 60 to 80 feet high, and 4 or 5 in diameter, comparing well in its dimensions with No. 1. The leaves are 6 or 8 inches long, 3 or 4 broad, and rounded at base. The flowers are 4 or 5 inches broad, white, with a bluish or yellowish tinge, and very slightly odorous. The wood is somewhat similar to that of the *Tulip Tree*, is fine grained and takes a good polish, but is not so strong and durable. As an ornamental tree it is much admired.

5. LARGE-LEAVED UMBRELLA TREE. (*M. macrophylla*, Michx.)—This and No. 3 derive their names of *Umbrella Tree* from the mode in which their leaves spread from the ends of the branches. It is a rare product east of the Alleghanies, having been found only on the Chattahoochie in Georgia, in Middle Florida, and in Lincoln county of this State. West of the mountains it is more common, though in scattering groups and at wide intervals. In Lincoln it occurs in several places not far from the road between Lincolnton and Tuckaseegee Ford; as near Smith's, the Moore Mine, and Huntersville, 6, 10, and 18 miles from the former place. It chooses cool, rather moist and fertile situations, is from 15 to 30 feet high, and without any beauty of form. But its leaves and flowers surpass in size those of any tree or shrub in this country. The former are from 20 to 30 inches long, occasionally even longer, clustered at the ends of the branches and spreading from them like an Um-

brella, their two sides rounded at the base and diverging like ears from the leaf-stem. The flowers are 12 to 14 inches broad, white, with a broad purple spot on the inner base of the petals, and fragrant. It bears cultivation very well in our Middle District. In the Lower District it is not so manageable, but can there be grafted on the native Umbrella Tree, as was successfully done by the elder Michaux in his garden near Charleston.

6. LONG-LEAVED CUCUMBER TREE. (*M. Fraseri*, Walt.)—Found only in ravines of the mountains where it is known by this name, and also as *Wahoo* and *Indian Physic*. It is confined chiefly to the mountains of the Southern States, and is nowhere more abundant than in Ashe, Yancey and Burke. It is 40 or 45 feet high, with a diameter of 12 or 15 inches. The leaves are 8 or 9 inches long, 4 to 6 broad, and though a third smaller, are very much like those of No. 5 in form; the base in this, as in that, being divided into rounded lobes or ears. The flowers are 3 or 4 inches broad, pure white, and of agreeable fragrance. The cones are 3 or 4 inches long, and, like those of the *Umbrella Tree*, of a beautiful rose color when ripe. This tree bears removal remarkably well, it having been cultivated in the open air near Philadelphia, but it would probably require the protection of shade in our low country.

7. HEART-LEAVED CUCUMBER TREE. (*M. cordata*, Michx.)—Often confounded with the *Cucumber Tree*, to which it bears a general resemblance, though it is a very distinct species. It is confined to declivities of the mountains from Ashe county to Georgia. It has a regular oval summit, is 30 to 50 feet high, 12 or 18 inches thick, with a straight trunk, the bark of which has some resemblance to that of Sweet Gum or of a young White Oak. The leaves are roundish and heart-shaped, 4 to 6 inches long, 3 to 5 wide. The flowers are yellow, the inside faintly streaked with red, and nearly 4 inches broad. The cones are about 3 inches long and 1 thick. This is smaller than the *Cucumber Tree*, but is equally desirable in private grounds as well for its symmetrical form as for the beauty of its flowers and its luxuriant foliage.

SERVICE BERRY. (*Amelanchier Canadensis*, Torr and Gr.)—Universally known in our Mountains under the name of *Sarvices*. In the Lower District it is called *Service Tree* and *Wild Currant*. In the latter section of the State, it is hardly more than a shrub, and

is common along branches and swamps. In the former, it inhabits the shaded sides of the Mountains, and is 15 to 25 feet high. The fruit is here much sweeter, more juicy and palatable, like the *Medlar*, than in other parts of the State, and trees are sometimes recklessly cut down to obtain it. It is purplish and about the size of some of our Red Haws. This shrub or tree, when displaying its profusion of clustered white blossoms in early Spring, is not without beauty, and is found enumerated in the catalogues of some northern Nurseries as *The Snowy Medlar*. A name so promising has occasionally led to its importation into the State for the adornment of a garden or shrubbery; but I have never known it preserved over one season's exhibition, the owners apparently depreciating a beauty so common.

1. CRAB APPLE. ((*Pyrus coronaria*, Linn.)—Most common in the Northern and North Western States, but extending southward along the Mountains, where alone it is seen in this State. In Yancey and Haywood counties it is very abundant, usually about 15 or 20 feet high, and 5 to 8 inches through; but in some situations considerably larger. The leaves are cut or lobed, not unlike those of the Red Maple. The flowers are of great beauty and diffuse their grateful fragrance to a long distance. The fruit is too austere for eating, but makes excellent preserves and jelly, though requiring much sugar.

A celebrated Cider Apple, known as *Hughes' Crab*, I suppose is a seedling from this species.

2. NARROW-LEAVED CRAB APPLE. (*P. angustifolia*, Ait.)—This extends from Pennsylvania southward, chiefly in those regions not occupied by the former. It is rather common in our Lower and Middle Districts, and reaches into the lower part of the Upper. It is of about the same height with No. 1, but the fruit and leaves are much smaller, the latter being narrow and merely toothed on the edge. The flowers are beautiful and fragrant as in the other species.

3. CHOKE BERRY. (*P. arbutifolia*, Linn.)—A mere shrub 2 or 3 feet high, introduced here only to complete an account of the genus. The fruit is berry-like, as in the *Mountain Ash*, but has the same structure as an Apple, with seeds of the same appearance and taste. It grows in small clusters, and is rather dry and

astringent. We have two varieties of this:—one, with a red or purple fruit, found on the borders of branches and bays in the Middle and Lower Districts;—the other, in the Mountains, and having a purplish-black fruit.

4. MOUNTAIN ASH. (*P. Americana*, D.C.)—This charming tree is but little known in this State, even in the Mountains where it grows. At the North, it is highly prized as an ornament in yards, especially for the beauty of its large clusters of scarlet berries, which hang upon the tree through the winter. It is scarcely distinguishable from the *Mountain Ash* or *Rowan Tree* of Great Britain. It is not very rare on our higher Mountains, from Ashe to Macon, where it is called *Wine Tree*, (from a kind of liquor said to be made from it,) and *Mountain Sumach*. The foliage is more like that of a *Sumach* than of any other of our trees; and in this respect, as indeed in every other, the general aspect of the tree is so unlike that of an *Apple Tree*, that none but a Botanist would suspect a relationship. The flowers are of a dirty white, in spreading clusters like those of the Elder, succeeded by berry-like scarlet fruit. In favorable soil this is from 12 to 20 feet high; in rocky ground, often a mere shrub.

PERSIMMON. (*Diospyros Virginiana*, Linn.)—Common in the United States from Rhode Island and New York southward, and in all the Districts of this State. It varies much in height according to situation and soil, but is usually from 30 to 40 feet, though sometimes as high as 60, with a diameter of 18 or 20 inches. When standing alone it has a very symmetrical form and is a handsome tree. The heart-wood is of a brownish tint, hard, compact, strong and elastic, but is said to be liable to split. It has been used for large screws, mallets, shoe-lasts (considered equal to those made of Beech,) and for the shafts of vehicles, which are said to be better than those made of Ash. With us the wood does not appear to be much used. The inner bark is astringent and tonic, and has had some reputation for being useful in intermittent fevers. The intolerable astringency of the green fruit is well known. When ripe it is liked by many, and is the basis of a beverage, by no means despicable, called *Simmon Beer*. It is sometimes pounded up with bran, and the cakes, dried in an oven, preserved for making Beer with the addition of hops and yeast. Brandy has been distilled from the fermented fruit, which is said to become good with age.

MULBERRY. (*Morus rubra*, Linn.)—Well known throughout the Union, but most abundant in the Western States. It grows in all parts of this State, but is least abundant in the Lower District. It is from 50 to 70 feet high, and 1 or 2 in diameter. When in proper soil, and unobstructed in its lateral expansion by surrounding trees, this becomes a tree of fine form and casts a very thick shade. The heart-wood is yellowish, fine grained and compact, but lighter than *White Oak*. It has much strength and solidity, and is thought by many to be as durable as *Locust*. It is much used in fencing and in ship and boat building. The leaves are too thick and rough for feeding silk-worms, though they have been used for the purpose in the absence of better. The fruit is deep red or purple, of a sweet and acidulous flavor quite agreeable to the taste. Though gently laxative, it is probably a wholesome fruit.

The *White Mulberry*, (*M. alba*), a native of Asia, is occasionally seen about houses, and is the tree chiefly used on the old Continent for rearing silk-worms. The *Chinese Mulberry* (*M. multicaulis*) is only a variety of the *White*, of smaller size and larger leaves. The *Black Mulberry* (*M. nigra*) of Europe is sometimes cultivated in this country, but I have not observed it in this State. The *Otaheite* or *Paper Mulberry* (*Broussonetia papyrifera*), a native of the Pacific Islands, is common in our yards, and is commendable for its rapid growth and heavy shade, but becomes a nuisance from its numerous shoots springing everywhere from its spreading roots.

CEDAR, OR RED CEDAR. (*Juniperus Virginiana*, Linn.)—Not uncommon throughout the country from New England to the Gulf of Mexico, but the soil and climate of the South are most favorable to its complete development. It is from 30 to 40 feet high, with a diameter of 10 or 12 inches, but is smaller in the mountains and western parts of the State than in the Lower District. In old fields solitary trees are sometimes seen of larger dimensions than are above given. It is not abundant enough, however, in any part of the State, to be used in the arts. The heart-wood is of a red color; but the sap is white. It is odorous, compact, fine grained and very light, but heavier and stronger than *Cypress* or *White Cedar*. It possesses durability in an eminent degree, and is applied to all purposes which require this quality. That which is grown near the coast is of better quality than what is produced farther inland.

This tree varies so much in the color, length and spread of the leaves in different situations and at different ages, that some persons make two species of it, one of which they call *Savin*. They are, however, but one species. The berries of this tree have been a little employed in the United States in the preparation of Gin, as those of the Juniper are used in Europe. Boxes and cabinets made of the wood are exempt from insects, its odor being offensive to them.

The remaining trees have all a *dry fruit*, but of various kinds, and no very intimate relationship—to be arranged in two GROUPS.

The first GROUP includes those trees which have either flowers or fruit in somewhat the form of tassels, as in the Willow, Cottonwood, and Birch.

POPLARS OR COTTONWOODS.

These are generally designated by the latter name in this country, but they are true *Poplars*. Those of them called *Aspens* are remarkable for the easy vibration of the leaves when scarcely a breath of air is perceptible. This results from one end of the leaf-stem being flattened contrary to the plane of the leaf. The constant motion of the leaves is supposed to have been the reason for giving these trees the name of *Populus* or *Poplar*, because they, like the *populace*, are never at rest. It is a more malicious spirit of slander that has given them the name of *Womens' Tongues*. The wood of all the species is soft and brittle, but some of them are used in various kinds of light wood-work.

1. CAROLINA POPLAR. (*Populus angulata*, Ait.)—This does not reach northward farther than southern Pennsylvania. It becomes more abundant in the low country of all the Southern States upon the marshy banks of rivers, in company with *Cypress*, *Red Maple*, &c. It is rare in the Middle District, but is sometimes cultivated there about houses. It is 60 or 80 feet high, with an expanded summit and pleasing foliage. The leaves are 3 to 5 inches long, (on young shoots 6 to 8,) thin, always smooth and bright on both sides, and their edges have small scalloped teeth. They are rounded at the base, and are marked with yellowish nerves. The buds are short, deep green, and not covered with gum. The young

branches and annual shoots are angular, from which character its botanical name of *angulata* is derived. The wood does not appear to be used. This is very similar to the *Cottonwood* or *Cotton Tree* so common on the Western Rivers.

2. COTTON TREE. (*P. heterophylla*, Linn.)—A native of the Middle, Western and Southern States, yet is so rare as to escape general notice. I do not remember to have met with it in this State, except in rich swamp lands on the lower course of the Cape Fear; but it probably occurs in similar ground elsewhere. It is a majestic, showy, tree, 70 or 80 feet high, 2 or 3 in diameter, with a very thick, deeply furrowed bark. The young branches and shoots are round. The leaves, 3 to 5 inches long, and with rounded teeth, are covered on the underside with a thick soft down, which partially falls off with age. The wood is much like that of the preceding.

3. LARGE TOOTHED ASPEN. (*P. grandidentata*, Michx.)—Not so common in the Southern as in the Middle and Northern States. With us it belongs to the upper part of the Middle District, is about 40 feet high, and has a smooth gray bark that seldom cracks. The leaves are 3 to 5 inches long, about the same breadth, with large open teeth on the edges, and the underside clothed, when young, with a thick white down which wholly falls away before the end of Summer. This tree is occasionally seen adorning the streets of our villages.

The *Lombardy Poplar*, (*P. dilatata*, Ait.) a native of Italy, is common in cultivation about old settlements.

BIRCHES.

These are products chiefly of high latitudes, both on the Eastern and Western Continents. In this State we have but a single species below the Mountains.

1. RED BIRCH. (*Betula nigra*, Linn.)—Common on the banks of rivers from the coast to the mountains, and known here only as *Birch*. This is sufficient designation where no other species occurs, but it is called *Red Birch* in those States and regions where it is accompanied by others. It is from 40 to 60 feet high, and 1 or 2 in diameter. It has wood of compact grain, and light reddish tint, but not of very high value, nor is it much used. It is some-

times employed in this State for the railing of balustrades, and the like purposes. Hoops for casks may be made from the branches and shoots, but of inferior quality.

2. BLACK BIRCH. (*B. lenta*, Linn.)—In our Mountains, where alone this tree is found within this State, it is simply called *Birch*. The most common name for it in the United States is the one above given. In the mountains of Virginia it is called *Mountain Mahogany*; in New England *Sweet Birch* and *Cherry Birch*. It is from 30 to 50 feet high, with a smoothish trunk, resembling that of a Cherry tree. The wood, freshly cut, is of a rosy hue, which becomes darker by exposure, and similar to that of *Wild Cherry*, and is used, like that, for several sorts of cabinet work. It has considerable strength, is of fine close grain, and susceptible of a brilliant polish, and is the most valuable of all the Birches known, though hardly equal to *Wild Cherry*. Furniture made of it, as chairs, tables, &c., will in time and by careful use, acquire very much the appearance of Mahogany. The leaves and blossoms have considerable fragrance, and the bark of the young shoots has a delightful spicy flavor like that of the *Mountain Tea* or *Spicy Wintergreen*. The tree is one of much beauty, with dark graceful foliage, and a symmetrical form.

3. YELLOW BIRCH. (*B. excelsa*, Ait.)—This is a northern tree, as south of the mountains of New York, with the exception of small patches in New Jersey and Pennsylvania, and the three or four stocks which I found near the (highest) summit of Black Mountain, it is unknown. Its yellowish-silvery bark, scaling off in thin sheets, like that of the *Paper* or *Canoe Birch*, will at once distinguish this from the two preceding. It is about 25 feet high. The timber is rather inferior to that of *Black Birch*. It is a handsome tree, and its twigs slightly aromatic.

WILLOWS.

There are 20 or 30 species of these in the United States, nearly all of which belong exclusively to the North. A few, though they are of no importance, extend to this State and farther south. The value of some species in wicker-work is generally known. The articles manufactured from them are made from the young, slender and flexible, twigs and shoots.

1. BLACK WILLOW. (*Salix nigra*, Marsh.)—This is the only native Willow in the State that becomes a tree. It is 15 to 25 feet high, with a rough dark-brown bark, very common along streams from the coast westward. The wood is soft and of little use; but when the stocks are of sufficient size, they are said to make durable light timbers for boats. The roots give an intensely bitter decoction, which is thought by some to be good for purifying the blood, and a remedy for intermittent fevers.

2. GRAY WILLOW. (*S. tristis*, Ait.)—A shrub 1 or 2 feet high, very much branched, of a dull gray aspect on account of the young branches and leaves being covered with an ash-colored down or wool. The leaves are from 1 to 1½ inch long with a hardly perceptible stem, narrow, sharp at each end, but tapering from the base towards the upper end, and with the veins prominent on the underside. I have met with this insignificant plant only in the mountain Counties.

3. BUSH WILLOW. (*S. humilis*, Marsh.)—Larger than the preceding, 2 to 4 feet high, but of similar general aspect, the leaves two or three times longer and broader, and found both in the Middle and Upper Districts, rarely in the Lower. During summer the branches of this and No. 2 have cone-like excrescences on their ends.

4. SILKY-LEAVED WILLOW. (*S. sericea*, Marsh.)—This is 3 to 6 feet high, with leaves 2 and 3 inches long, borne on conspicuous stems, pale, and with silky hairs on the underside.

The *Weeping Willow* (*S. Babylonica*,) is common, and the *Yellow Willow* (*S. vitellina*,) occasionally seen in cultivation.

HORNBEAM. IRONWOOD. (*Carpinus Americana*, Michx.)—Among the commonest productions of the country and well known by one or other of these names. It is found on the banks of streams in all parts of the State, generally 12 or 15 feet high, but sometimes 25 or 30, with a diameter of 5 or 6 inches. The trunk has a smooth gray bark, and at the base is irregularly fluted or ridged. The wood is white, exceedingly hard, compact and fine grained, but the small size of the tree forbids its use except for inferior purposes.

HOP HORNBEAM. (*Ostrya Virginica*, Willd.)—This and the preceding have characters and qualities so very similar that they are

generally called by the same names. But the bladdery fruit of this looks so much like *Hops* that it can very easily be distinguished through the summer. It is only in the Upper District that I have met with it, and very rarely there. It is 20 or 30 feet high, with a brownish finely furrowed bark, the trunk not ridged at the bottom like the preceding. The wood is like that, and also used for levers, &c., for which we have nothing better adapted, on account of its great strength and toughness. For mill-cogs, wedges, mallets, and the like, both these species would doubtless answer well.

The remaining Group includes a heterogeneous mass of dry-fruited Trees, but fortunately nearly all are so well known, that they will need no particular description.

SYCAMORE. (*Platanus occidentalis*. Linn.)—This is the name generally given, I believe, to this tree in North Carolina; but it is more extensively known in the United States as *Buttonwood*. In some sections it is called *Water Beech* and *Plane Tree*. The last would be most appropriate, if we were governed in our choice by the application of the names of kindred species in Europe. The *Sycamore* of Europe is a species of *Maple*, having no relationship with what we call by that name.

This tree, like the *Planes* of the old Continent so much celebrated by the Ancients, is among the largest in the Temperate Zones. It is common over the United States on the borders of streams, where the soil is moist and fertile, conspicuous for its white bark and the stately size of its trunk. In such situations it is found throughout the State, but is least abundant in the Lower District. Although occasionally found here of large dimensions, it is not of such size as in the virgin forests of the West, where this tree has its peculiar home, and where it is sometimes seen without branches to the height of 60 and 70 feet, and with a circumference of 40 or 50 feet. A hollow section of a trunk was once used in Ohio as a Bar Room;—the same, I believe, now exhibited in a New York Museum. This reminds us of the famous Plane tree of Lycia, mentioned by Pliny, whose hollow trunk gave shelter for a night to Licinius Mutianus and a retinue of eighteen persons. Its interior was 75 feet in circuit. The wood of our tree becomes reddish in seasoning, of a fine close grain, and takes a better polish than *Beech*, to which it bears some resemblance. As it is liable to warp, it is

not much used in cabinet work, except for Bedsteads. It decays rapidly by exposure to the weather, and is therefore suitable for such articles only as are thoroughly sheltered. The rapid growth, great size, and thick shade of this tree, render it valuable for avenues and shaded grounds.

SWEET GUM. (*Liquidambar Styraciflua*, Linn.)—One of the most extensively diffused tree, in North America, it being found from southern New England to Mexico. It is from 40 to 70 feet high, and 2 to 3 in diameter. The wood is reddish, compact, fine grained, and takes a fine polish. Though inferior to Oak, it is suitable for objects requiring toughness and solidity. When properly seasoned, it serves well in the upper frame work of buildings, and lasts better than any of the *Red Oaks*. It is sometimes employed for lining the inside of Mahogany furniture, to which it is well adapted by its color, lightness, and fine grain. Though inferior to *Black Walnut* and *Cherry*, it is sometimes used for similar purposes in the manufacture of furniture; but is not durable unless sheltered from the air. The bruised leaves have a resinous fragrance, and fresh ones are successfully used in cases of dysentery. The dusty matter in the ripe burs is only the abortive seeds. The fragrant gum is the hardened juice. This is a beautiful tree, especially in Autumn, when the dying foliage has taken its hue of deep crimson, and should be oftener seen in private grounds.

TULIP TREE, OR POPLAR. (*Liriodendron Tulipifera*, Linn.)—This tree is rarely surpassed in elegance of form, in size, beauty of foliage, or showiness of blossom, by any tree of the American forests. In some of the Northern States it is called *White Wood* and *Canoe Wood*. In Europe, where it has been long and extensively introduced, it bears the name of *Tulip Tree* (which has been adopted to some extent in this country,) from the resemblance of its flower to that of a Tulip. This is much preferable to that of *Poplar*, (which it bears in this and the Western States,) because it has but little resemblance in any particular to the true Poplars. It is native in all parts of the State, but is not so common in the Lower District as in others. It is from 60 to 100 feet high, with a very straight tapering trunk, and has a diameter of 2 or 3 feet. There is a stock on the South Fork of Toe River, which is near 9 feet in

diameter. The wood is fine grained, works easily and takes a good polish. It is heavier and more compact than that of the *Poplars*. The heart is yellowish, and the sap-wood white, though when grown in dry gravelly soils the whole wood is white and coarser. These are distinguished as *Yellow* and *White Poplar*, the former being most valuable. For the rafters and joists of buildings the timber is the best substitute for Pine, Cedar, and Cypress. The boards are often used for the exterior and interior work of houses, even for shingling, as they are durable and not liable to split from the influences of heat and moisture. They are much used by Coach, Chair, and Trunk makers, and are very valuable for all kinds of wood-work requiring lightness, strength and durability.

The bark of the root, mixed with equal parts of *Dogwood* bark, is a domestic remedy in intermittent fever. Some Physicians have employed it successfully alone, or accompanied with Laudanum, in remittent and intermittent fevers, cholera infantum, hysterical affections, and for worms; but others have denied its efficacy. Dr. Darlington says that the bark of the root and young tree is a valuable aromatic bitter.

LINN OR LIME TREES.

These are handsome trees, as well for their form as for the pleasing hue and fine shade of their foliage. They are known in the Northern States by the names of *Lime Tree* and *White Wood*, but more generally by that of *Bass Wood*. In Europe the species of this genus are called *Linden* and *Lime Trees*. The wood is white and soft, and is used for similar purposes with that of the *Tulip Tree*, where the latter is not found, but is softer and splits more readily. It is well adapted for Turners' work, and is extensively used in the manufacture of wooden ware. The inner bark, when macerated, separates into broad fibres, which are used for making coarse cordage and matting. In Europe this kind of stuff is called *Bast*, (whence the name of *Bass Wood*), and large quantities are exported from Russia. The bark also contains a good deal of mucilage, from which liniments are prepared for burns and scalds. In Europe, the honey made from the flowers of the Linn is considered the best in the world, and when made exclusively from them sells for more than double the price of any other. The flow-

ers of our American species would very likely serve as well in improving the quality of honey, There are but 3 species of Linn in the United States, and all are found in North-Carolina. The flowers of the Linn are small, cream-colored, growing in loose clusters upon a common stem which is attached to the middle of a narrow, strap-like, leaf or bract;—a character that will distinguish these trees from all others.

1. AMERICAN LINN. (*Tilia Americana*, Linn.)—This is found from Canada to Georgia; in this State confined to the mountains and the upper part of the Middle District. It is a handsome tree, 50 to 80 feet high, 1 to 4 in diameter. The leaves are 3 or 4 inches broad, heart-shaped, but one side smaller than the other at the base, smooth or nearly so, and paler green on the underside. The timber of this species is considered more valuable than that of the others.

2. WHITE LINN. (*T. heterophylla*, Vent.)—More abundant in the Middle and Western States than elsewhere. In this State it is most common in the Upper District, but occurs sparingly in the Middle and Lower. It seldom exceeds 40 feet in height, with a diameter of 12 or 18 inches. The young branches have a smooth silver-gray bark, by which it can be distinguished in Winter from the other species. The leaves are quite large, 6 to 8 inches broad, deep green above, and with a silver-white down underneath.

3. SOUTHERN LINN. (*T. pubescens*, Ait.)—This is confined to the Lower Districts of the Southern States, choosing cool fertile soils upon the borders of swamps and rivers. It is 40 or 50 feet high, resembling No. 1, of which it may be only a variety. The leaves are 2 to 4 inches broad, shaped as in No. 1, the edges with fewer and more distant teeth than in No. 2, and with a rusty, thin, vanishing down on the underside.

SOUR WOOD. SORREL TREE. (*Oxydendrum arboreum*, DC.)—This extends from Pennsylvania southward, especially along the mountain valleys. In our Lower District it is rare, not uncommon in the Middle, but is most abundant in the lower parts of the Mountains. It is usually a small tree, but in some localities, as on the upper waters of the Catawba, it attains a height of 50 or 60 feet, and a diameter of 12 or 15 inches. The wood is of no value. The leaves, which are not unlike those of the Peach, are acid like

Sorrel, from whence its names are derived. These, in the absence of Sumach, are sometimes used for dyeing wool of a black color. The small flowers, about the size and form of those of our swamp Huckleberry, are in large loose clusters, which hang in profusion over the branches with somewhat of a plume-like grace, and make this tree one of the ornaments of our woods.

LOBLOLLY BAY. (*Gordonia Lasianthus*, Linn.)—This pretty tree, belonging to the family of the *Camellias*, belongs within the range of the *Long-leaved Pine*, and is there confined, I think, to the branch-swamps and bays within 100 miles of the coast. It is from 50 to 70 feet high, with a diameter of 18 to 24 inches. When young, it is of a fine pyramidal form; but with age the branches spread irregularly, and the top, owing possibly to the brittleness of the wood, seems subject to early decay. The leaves are evergreen, with sharply toothed edges. The flowers are about 2 inches broad, white, and somewhat fragrant, and young trees in blossom are very attractive. The wood is of rosy hue, of fine texture and silky lustre, but is light and brittle, and subject to rapid decay, unless kept perfectly dry. The bark is valuable for tanning, but is not abundant enough for extensive use. The fruit is a small, dry, woody capsule, $\frac{1}{2}$ to $\frac{3}{4}$ inch long.

SNOW DROP TREE. (*Halesia tetraptera*, Linn.)—Found but a short distance beyond the northern line of this State. In our Lower District it is very sparingly distributed. In the Middle District I have not seen it east of Surry and Mecklenburg, but from thence westward to Cherokee it is not uncommon along water courses, especially above that part of their course where they are generally turbid. It is ordinarily a small tree, from 10 to 25 feet high; but upon some of our mountain streams it acquires nearly double these dimensions. It is not of handsome form; but its clusters of white bell-shaped flowers (similar to those of the garden *Snow Drop*) about half an inch long, give it an aspect of much beauty when in blossom. I have never seen it in cultivation, but it deserves a conspicuous place in the cool moist parts of ornamented grounds. The fruit is greenish and slightly juicy when young, becoming dry. It has 4 winged angles, is about $1\frac{1}{2}$ inches long, with a bony nut inside.

PLANER TREE. (*Planera aquatica*, Gmel.)—This tree, closely related to the *Elm* and the *Hackberry*, is rare in the Atlantic States and unknown north of the Cape Fear River. From thence southward it is found on the borders of streams and swamps, and may very easily be mistaken, at a little distance, for the *Hornbeam*. It is from 20 to 40 feet high, and 8 to 15 inches in diameter. The wood is said to be hard and strong, but is too rare with us to be of any use. The leaves are about $1\frac{1}{2}$ inch long, and much like those of our *Small-leaved Elm*. The flowers are in a small, round greenish cluster about the size of small Peas and appearing before the leaves. The fruit is a nut covered with warty scales, quite small.

THE SHRUBS

OF

NORTH-CAROLINA.

Under this head will be included those woody plants which do not ordinarily exceed 20 feet in height, whatever may be their form. So many of these are without names, and there is such a variety in their fruits or seed-vessels, that I can not make so intelligible an arrangement of them for popular use, as I have done for the Trees. Still, I hope that most of them, and all that are of any importance, can be identified without much difficulty. They will be arranged, like the Trees, according to the character of their fruit, under the two primary divisions of the *Fleshy Fruited* and *Dry Fruited*, beginning with the former.

Quite a number of *Shrubs* have been already described under the class of Trees, wherever a genus included both classes.

RED HAWS. Thorny shrubs, sometimes tree-shaped, with white flowers, mostly in flat topped clusters, and colored (generally red) fruit containing 1 to 5 bony seeds.

1. **SCARLET HAW.** (*Crataegus coccinea*, Linn.)—Grows in the Middle and Upper Districts, 6 to 12 feet high, with stout thorns 1 and 2 inches long. The leaves are smooth and thin, about 2 inches long and broad, cut into several small segments on each side. The fruit is bright red, $\frac{1}{2}$ inch or more long, and eatable.

2. **WASHINGTON THORN.** (*C. cordata*, Ait.)—I have seen this only in the Middle District. It is a very beautiful shrub when in blossom, as may be seen on the Cape Fear near Averysboro' in May. It is from 10 to 20 feet high, the thorns about 2 inches long, and rather slender. The leaves are 2 and 3 inches long, cut into 3 divisions somewhat like those of the Red Maple. The fruit is bright crimson, about $\frac{1}{4}$ inch long.

3. PARSLEY-LEAVED HAW. (*C. apiifolia*, Michx.)—This, so closely resembling the *Hawthorn* of England, is found in the Lower and Middle Districts. The leaves are about 1 inch long, and much cut up into small divisions, from which this handsome shrub or small tree derives its name, and by which it is easily distinguished from all the other species. The fruit is red and about $\frac{1}{4}$ inch long.

4. COCKSPUR THORN. (*C. Crus-galli*, Linn.)—The most abundant of our *Thorns* or *Haws*, and found in all the Districts. It is 10 or 20 feet high and armed with sharp thorns 2 inches or more long. The leaves are about 2 inches long, rather thick and stiff, shining green above, somewhat tapering from the upper part downward, and toothed above the middle. The fruit is red, about $\frac{1}{3}$ inch long. This is our best species for hedging. But it should be remembered, that none answers well if left at random to an upward growth, and is not well laid and so regularly trimmed, or cut in, as to take a lateral growth and to branch freely near the ground.

5. BLACK THORN. (*C. tomentosa*, Linn.)—A shrub or small tree in the Middle and Upper Districts, with large clusters of flowers, which are $\frac{3}{4}$ inch or more broad, and a round or pear-shaped, edible fruit, which is orange-red and about $\frac{3}{4}$ inch long. The leaves are 3 to 5 inches long, of an oval or oblong form, finely toothed and sometimes cut at the summit, somewhat hairy on the under-side, and more or less furrowed along the veins above.

There is a form of this (var: *punctata*, Gray,) very common on the tops of our Mountains, with the leaves smaller, more narrowed towards the base, and the furrows on the upper surface deeper, and the veins more prominent beneath. The fruit is round, yellowish or dull red, sprinkled with whitish dots.

6. NARROW-LEAVED THORN. (*C. spathulata*, Michx.)—Not uncommon in the Lower and Middle Districts, 10 to 15 feet high, with quite small flowers and fruit, but rather ornamental. The leaves are smooth and shining, $\frac{1}{2}$ to $1\frac{1}{2}$ inch long, $\frac{1}{4}$ to $\frac{1}{2}$ inch wide, toothed at the upper end and tapering from near the top down to the stem. The fruit is red and in numerous clusters.

7. SUMMER HAW. (*C. flava*, Ait.)—A small tree 15 or 20 feet high, in sandy woods, with fruit $\frac{1}{2}$ to $\frac{3}{8}$ inch thick, pear-shaped, and greenish-yellow. The leaves are 2 or 3 inches long, wedge-shaped, the lower part tapering into a short stem with small dark glands on the edges. The flowers but from 2 to 5 in a cluster.

8. **HAIKY THORN.** (*C. glandulosa*, Michx.)—A small tree with coarse bark and spreading branches, and the leaves, branchlets and flower stems, covered with soft hairs, especially when young. The leaves are about 1 inch long, rather thickish, wedge-shaped, the edges generally dotted with dark glands. The fruit is small, round, and red. The flowers are 3 to 6 in a cluster.

9. **DWARF THORN.** (*C. parvifolia*, Ait.)—A small shrub 2 to 5 feet high, very common in sandy woods throughout the Lower and Middle Districts, and with a whitish down on most of its parts. The leaves are $\frac{1}{2}$ to $1\frac{1}{2}$ inch long, broad wedge-shaped, toothed, with hardly any stem. Flowers solitary, or 2 or 3 together. Fruit round or pear-shaped, greenish-yellow, rather large and dry.

BARBERRY. (*Berberis Canadensis*, Pursh.)—Found in Lincoln, thence westward, especially in Buncombe, Haywood, and Macon Counties. It is not known to exist north of Virginia, and is the only native Barberry in the United States. The European species (*B. vulgaris*) is thoroughly naturalized in New England. Ours is a pretty shrub, 2 to 4 feet high and somewhat prickly. The fruit is an oblong, red and acid berry, which makes an agreeable conserve, and a cooling drink in fevers. The leaves are also slightly acid. It is probable that this, like the European species, which it closely resembles, would furnish a yellow color by boiling the roots in lye; and that the inner bark of the stems would dye linen of a fine yellow with the assistance of alum.

GOOSEBERRIES AND CURRANTS.

These belong to one genus, but are distinguished—the former, by the small sharp thorns at the base of the leaves, sometimes the fruit being prickly and generally (always in the North-Carolina species) by the flower stems having from 1 to 3 flowers; the latter, by the absence of thorns, smaller fruit, (never prickly,) and the flowers numerous in long clusters. They are found only in the Mountains.

1. **PRICKLY GOOSEBERRY.** (*Ribes Cynosbati*, Linn.)—Distinguished from the others by its prickly fruit, which is brownish when ripe, and eatable.

2. SMOOTH GOOSEBERRY. (*R. rotundifolium*, Michx.)—This is 3 or 4 feet high, the leaves 1 or 2 inches broad, about half the size of the preceding, the fruit small, purple when ripe, and of fine flavor.

3. SLENDER GOOSEBERRY. (*R. gracile*, Michx.)—Very similar to No. 2, but every way more slender and delicate, and quite rare.

4. FETID CURRANT. (*R. prostratum*, L'Her.)—Occurring chiefly upon rocks on our highest Mountains and generally spreading on the ground. The berry is covered with bristles and is not pleasant flavored. The whole plant exhales a disagreeable musky odor, which will readily distinguish it.

5. BRISTLY CURRANT. (*R. resinosum*, Pursh.)—This was discovered in our Mountains by Fraser. I have not myself met with it. It is covered in every part, not excepting the fruit, with resinous glandular hairs, by which it may be recognised.

HUCKLEBERRIES.

The fruit so called in this State is comprised in two genera; the first, (*Gaylussacia*), including those which have a *black* or *blackish* berry, and leaves generally covered with small glandular dots; the second, (*Vaccinium*), including those with a *blue*, *red* or *greenish* berry. The blue ones are known in some States as *Blueberries* or *Bilberries*. The red are *Cranberries*. The greenish one is, in this State, called *Gooseberry* and *Deerberry*.

1. BLUE HUCKLEBERRY. (*Gaylussacia frondosa*, Torr and Gr.)—Common in the Lower and Middle Districts on the borders of low grounds, 2 or 3 feet high, with pale, somewhat wrinkled, leaves, which are whitish underneath, and 1 to 3 inches long. The berries are dark blue, large and sweet, perhaps the finest flavored we have, ripening in June.

2. DWARF HUCKLEBERRY. (*G. dumosa*, Torr and Gr.)—A low species about a foot high, with creeping roots, very common in dry woods of the Lower and Middle Districts. It is somewhat hairy and glandular, the leaves broad, wedge-shaped, green on both sides, and the fruit smooth, black and insipid. A larger form of this (var. *hirtella*), has the berries also hairy.

3. BLACK HUCKLEBERRY. (*G. resinosa*, T. and Gr.)—Belongs to the Middle and Upper Districts, 2 or 3 feet high and much

branched. The leaves are 2 or 3 inches long, and thickly sprinkled with resinous atoms. The berries are black, shining and very pleasant. There is a white variety of this, found in the mountains by Mr. Buckley.

4. BEAR HUCKLEBERRY. BEARBERRY. (*G. ursina*, Gray.)—Found on the sides of the mountains, south of the French Broad river, 2 or 3 feet high, and resembling No. 3. But in the latter the flowers are cylindrical; in the Bearberry cup-shaped. The berry is purplish or dark red, insipid and dry, ripening in July and August.

1. SWAMP HUCKLEBERRY. (*Vaccinium corymbosum*, Linn.)—Abundant in swampy grounds of the Lower and Middle Districts, and probably extending into the Upper. It is from 5 to 10 feet high, with very variable leaves, but generally thin, pale and smooth. The berries are large, deep blue, subacid and pleasant, ripening in May and June.

There is a variety of this (var. *atrococcum*, Gray.) having a similar range and locality and size, but much less common, with thicker leaves which are white-downy underneath, and with berries *dark blue*. Dr. Hunter finds this variety with a *white* berry in Lincoln and Burke counties.

2. PALE DWARF BLUEBERRY. (*V. Constablæi*, Gray.)—About 1 foot high, abundant on the bald summit of Roan Mountain, (where it was first discriminated by Prof. Gray,) and not unlikely on others. It is of a pale whitish aspect, with leaves 1 or 2 inches long, and blue sweet berries.

3. (*V. tenellum*, Ait.)—Common on the borders of small swamps in the Lower District and extending somewhat into the Middle; about 2 feet high, with green, angled branches. The leaves $\frac{1}{2}$ to 1 inch long, narrow, wedge-shaped, slightly toothed at the top, and of a bright green. Berries black, small, of little worth.

4. BRISTLY HUCKLEBERRY. (*V. hirsutum*, Buckley.)—Discovered in the Cherokee Mountains by Mr. Buckley, and easily recognized by its bristly branches, leaves, flowers and fruit.

5. DEERBERRY. GOOSEBERRY. (*V. stamineum*, Linn.)—Very common all over the State in dry woods, 1 to 4 feet high, and very pretty when in blossom. The berries are greenish-white, sour and astringent, larger than any other of our Huckleberries.

6. (*V. erythrocarpon*, Michx.)—A shrub 2 to 4 feet high, found upon Grandfather, Flat Top and Roan Mountains. The leaves are rather hairy and with small teeth on the edges. The flowers have long divisions that are rolled backwards precisely like those of the *Cranberry*. The fruit is small, reddish or purplish, and insipid, somewhat like that of the *Bearberry*.

7. SPARKLEBERRY. (*V. arboreum*, Michx.)—Found from the coast to Cherokee, 8 to 20 feet high, the leaves smooth, rather stiff and shining. They are evergreen, at least in the Lower District. The fruit is black and small, dry, granular and slightly astringent, but of pleasant flavor, ripening in October. When in blossom it is quite a showy shrub. The bark of the root is very astringent, and is used in chronic dysentery.

8. CREEPING HUCKLEBERRY. (*V. crassifolium*, Andr.)—A small species with stems (1 or 2 feet long) creeping close upon the earth in wet savannas of the Lower District. The leaves are small, $\frac{1}{4}$ to $\frac{1}{2}$ inch long, evergreen, thick and shining. The fruit is red, becoming black, tasteless.

9. CRANBERRY. (*V. macrocarpon*, Ait.)—A small trailing plant with pale evergreen leaves, common in the mountain swamps of Ashe and Yancey, and also in Pasquotank, Hyde and other counties in the north-eastern part of the State. The fine acid fruit of this plant is well known and universally esteemed.

CORAL BERRY. (*Symphoricarpus vulgaris*, Michx.)—A small shrub, 2 or 3 feet high, frequent in arid gravelly soils, especially by road sides, throughout the Middle District. The leaves are rather stiff, about 1 inch long, downy beneath. The flowers are of no beauty, but the compact clusters of dark red berries in the fork of nearly all the leaves, and which hang on through the winter, have made it an object of attention among Gardeners and Florists. This is sometimes so much of a nuisance on plantations, on account of its creeping tangled roots, as to have gained the uncouth name of *Devil's shoe-strings*.

BERMUDA OR FRENCH MULBERRY. (*Callicarpa Americana*, Linn.)—Quite common in light soils and dry open woods of the Lower District, especially along fence-rows and the borders of settlements. It is 3 to 6 feet high, with coarse, rough, grayish unsightly leaves,

which are 4 or five inches long and round-toothed on the edges. But in winter the numerous clusters of light-purplish berries which encircle the summit of the branches at regular intervals for 12 or 18 inches, give it a very striking and pleasing appearance. These berries are juicy, slightly aromatic and sweetish, and are sometimes eaten, but are probably not very wholesome.

MISTLETOE. (*Phoradendron flavescens*, Nutt.)—Well known throughout the State, and needing no description. With us it seems to prefer the *Oaks* and *Locust*, but at the North and West, *Elms* and *Hickories*. Deer are very fond of this plant. This is a different plant from the European Mistletoe, the *aureus ramus* of Virgil.

1. **HIGH BLACKBERRY.** (*Rubus villosus*, Ait.)—This is our common Blackberry of the swamps and fallow lands, 4 to 10 feet high, and the leaves slightly hairy or smooth, and green on both sides. It is found throughout the State. The root of this is slightly astringent, and is a popular remedy for diarrhœa.

2. **LOW BLACKBERRY.** (*R. cuneifolius*, Pursh.)—Common in old fields and by road-sides in the Lower and Middle Districts, 2 to 4 feet high, the leaves white and downy beneath. Smaller in all parts than No. 1, the berries generally sweeter.

3. **DEWBERRY.** (*R. trivialis*, Michx.)—Generally well known under this name, but most abundant in the Middle District. This is a trailing species with smooth green leaves, growing mostly in dry soils, and with larger, sweeter fruit than the preceding.

4. **SWAMP BLACKBERRY.** (*R. hispidus*, Linn.)—A prostrate species like the preceding, found in the mountain swamps, but every way more delicate, with thinner leaves, and with weak prickles that hardly deserve the name. Fruit black, small and sour.

5. **BLACK OR PURPLE RASPBERRY.** (*R. occidentalis*, Linn.)—Grows on the borders of woods and in thickets through the Middle District. The fruit is very pleasant but rather dry, and much inferior to the cultivated species.

6. **FLOWERING RASPBERRY.** (*R. odoratus*, Linn.)—Found only in the Mountains along rivulets and in cool shaded ravines. This is without prickles, but is covered with clammy hairs, is 4 or 5 feet high, and has leaves 6 or 7 inches long, divided into about 5 short

segments. The flowers are quite ornamental, about 2 inches broad and looking like a small single Rose. The fruit is broad, red and dry, but pleasant flavored.

1. SWAMP ROSE. (*Rosa Carolina*, Linn.)—This is from 3 to 6 feet high, is generally confined to low damp grounds, and has stout *hooked* prickles.

2. WILD OR DWARF ROSE. (*R. lucida*, Ehrh.)—Generally prefers dry soils, and is found in all the Districts. It is about half the size of No. 1, has the leaves shining on the upper side, and has *straight* prickles, which will distinguish it from the preceding.

3. SWEET BRIER. (*R. rubiginosa*, Linn.)—Extensively naturalized along roads and about settlements, especially in the Middle District, and easily recognized by the pleasant fragrance derived from the rusty colored glands on the underside of the leaves. This is sometimes known as the *Eglantine*.

4. CHEROKEE ROSE. (*R. lævigata*, Michx.)—Cultivated in the Lower and Middle Districts, often trained over fences, and, if well managed, serves well for hedging. It is remarkable for its smooth dark evergreen leaves and white single flowers. It is singular that the native region of this Rose is unknown.

1. ELDER. (*Sambucus Canadensis*, Linn.)—There is no portion of the State, except the higher parts of the Mountains, where this shrub is not found. Its leaves are smooth and its berries dark purple. The inner bark is of popular use in ointments for sores. An infusion of the leaves is sometimes used for expelling insects from vines, &c. An infusion of the dried flowers is a domestic remedy for colds. The ripe berries afford a delicate test for detecting acids and alkalies.

2. RED BERRIED ELDER. (*S. pubens*, Michx.)—Grows only on the higher Mountains above the range of the preceding, from which it is at once distinguished by its red berries and the downy underside of its leaves. It belongs chiefly to a high latitude.

1. BLACK HAW. (*Viburnum prunifolium*, Linn.)—Common in rather dry rich soils from the coast to the lower part of the Upper District, 8 to 15 feet high, handsome when in flower. The blossoms are small, white, in flat clusters, which are two or three inches

broad, and destitute of a common stem. The leaves, 1 or 2 inches long, are smooth and shining above. The fruit is about half an inch long, bluish-black, sweetish and eatable.

2. *Possum Haw.* (*V. nudum*, Linn.)—Has a similar range with No. 1, and grows in cold swampy grounds, 6 to 12 feet high. The flower clusters in this are supported on a short common stem. The leaves are larger and of thicker texture than in the former, dull green above, and covered with rusty scales beneath. The fruit is a deep blue. In the Mountains I have heard this called *Shawnee Haw.*

There is a form of this (var: *angustifolium*.) with smaller, narrower and brighter leaves, which I have met with in Henderson County.

3. (*V. obovatum*, Walt.)—A shrub or small tree, growing on the banks of streams, but not common in this State. The leaves are $\frac{1}{2}$ to 1 inch long, rather thick, smooth, broader at the upper end, and faintly toothed. The flower clusters are without a general stem. The fruit is black.

4. *SHEEP-BERRY.* (*V. Lentago*, Linn.)—Found only in the Mountains, 10 or 15 feet high. The leaves are rather thin, 3 or 4 inches long, smooth, with a tapering point, sharply toothed, their stem and middle nerve beneath, together with the flower branches, sprinkled with rusty atoms. The fruit is first red, then bluish-black, and is eatable when fully ripe.

5. *ARROW-WOOD.* (*V. dentatum*, Linn.)—Grows in low grounds of the Lower and Middle Districts, but is not very common. It is 8 to 12 feet high, with ash-colored bark, and by the flowers and fruit would be at once recognized as belonging to the same genus as Nos. 1 and 2. The leaves are roundish, 2 or 3 inches long, coarsely and sharply toothed, thin and smooth, the lateral veins quite straight, and deeply impressed above. The fruit is roundish and deep blue, and slightly rough. The young straight branches of this were used by the Indians for making arrows.

6. *DOWNY ARROW-WOOD.* (*V. pubescens*, Pursh.)—Very similar to No. 5, but smaller, 3 or 4 feet high, the underside of the leaves downy, and growing only in the rocky soil of the Mountains.

7. *MAPLE-LEAVED ARROW-WOOD.* (*V. acerifolium*, Linn.)—A shrub 2 to 5 feet high, found in the Mountains and on rocky hills of the Middle District, as low down as Orange, with leaves 3 or 4 inches long, shaped like those of a *Maple*. The berries are whitish,

becoming purplish-black. The slender stems, by removing the pith, make good *fuse-sticks* for blasting, and will serve equally well for blasts of tobacco-smoke.

S. HOBBLE-BUSH. TANGLE-LEGS. (*V. lantanoides*, Michx.)—A small straggling shrub found in cold damp places in the Mountains. The branches spread upon the ground, and, taking root at their ends, form well secured loops for tripping the feet of inexperienced way-farers; a habit which has been revenged upon by the unlucky, in the names imposed upon it of *American Way-fairer's Tree* and the *Devil's Shoe-strings*. The leaves are 3 to 6 inches broad, heart-shaped, very veiny, the underside having a rusty down. The berries are first crimson, then black. The flowers on the margin of the broad clusters of this species are very large (by abortion,) like those of the well known *Snow-ball* of our Gardens, which is a species (*V. Opulus*), of this genus.

PRICKLY ASH. (*Aralia spinosa*, Linn.)—Found in tolerably rich soil from the coast to Cherokee, but not very abundant in any locality. It is seldom 20 feet high with us, and is remarkable for its straight, club-shaped, prickly stem or trunk, with the compound leaves spreading like those of a Palm from its summit. An infusion of the fresh bark of the root is emetic and cathartic, and is employed, as are also the berries, in spirituous infusion, in rheumatic affections. These are thought by some to be also a valuable remedy for the bite of a Rattlesnake.

PRIVET. (*Ligustrum vulgare*, Linn.)—Occasionally naturalized about settlements. Berries black. This is suited for low hedges.

1. SPICE BUSH. (*Benzoin odoriferum*, Nees.)—Known also as *Spice Wood*, *Wild Allspice*, and *Fever Bush*. Grows in damp woods throughout the State, and, wherever found, known under one or other of these names. It is a strongly scented shrub, smooth, 3 to 6 feet high, with dark red berries, and leaves 3 or 4 inches long. An infusion of the twigs is sometimes used in country fevers, and for sickly cattle in the Spring.

2. (*B. melissæfolium*, Nees.)—Belongs to the Lower and Middle Districts in low grounds and on the borders of shallow ponds, 2 or 3 feet high, leaves silky on both sides, 1 or 2 inches long, slightly

heart-shaped, berries red. I am indebted to Dr. McRee and Prof. Mitchell for my knowledge of this species.

POND BUSH. (*Tetranthera geniculata*, Nees.)—Occupies small ponds in the Lower District, giving a gray smoky aspect to these localities. It is rarely met with in the lower part of the Middle District. It is 10 or 15 feet high, with smooth, zigzag branches, and small oval leaves, $\frac{1}{2}$ to 1 inch long, and red berries.

This and the genus next preceding are closely related to the *Sassafras*, and, like it, has small yellowish flowers which appear before the leaves.

LEATHER-WOOD. (*Dirca palustris*, Linn.)—Widely diffused over the country, but in this State occurring sparingly upon shaded rivulets in the Middle and Upper Districts. It is 3 to 5 feet high, and the branches have such a tough and pliable bark that they make excellent ligatures, for which they were used by the Indians, and from which the shrub derives its name. The fruit is a small reddish berry.

CAROLINA BUCKTHORN. (*Frangula Caroliniana*, Gray.)—A thornless shrub, 4 to 6 feet high, belonging to moderately fertile soils in the Middle and Lower Districts, but rare in the latter. The leaves are 3 or 4 inches long, 1 or 2 wide, dark green, smooth and shining, and ribbed with very straight parallel veins. The berry is blackish, of the size of a small pea.

1. **SUMACH.** (*Rhus copallina*, Linn.)—Very common throughout the State, usually 6 to 10 feet high, sometimes a small tree 15 feet high, readily distinguished by its common leaf-stem being margined or winged between the leaflets. The crimson hairs on the berries possess a strong acid, (said to be Malic,) an infusion of which, with sugar, makes an agreeable cooling beverage, and, without sugar, is a very useful gargle for weak or sore throats.

2. **SMOOTH SUMACH.** (*R. glabra*, Linn.)—This is 6 to 10 feet high, growing in the Middle and Upper Districts, and is remarkably smooth in all its parts. A milky juice issues from the wounded bark. The large clusters of red fruit are more compact than in No. 1, having an acid secretion as in that. The branches and leaves are astringent, and are used for tanning.

3. STAGHORN SUMACH. (*R. typhina*, Linn.)—Belongs to the Upper District, 10 to 20 feet high, the branches and flower stalks densely and rather softly hairy, somewhat like a Deer's horn "in the velvet." The leaflets are narrow and tapering. The bark issues a milky juice, and the berries are acid, as in No. 2. The wood is orange colored and aromatic. The bark and branches are used for tanning. The large clusters of purple fruit, and a fine foliage, render this species quite ornamental.

4. DWARF SUMACH. (*R. pumila*, Michx.)—This has a general resemblance to No. 3, especially in the dense hairiness of the young branches, but the leaflets in this are much shorter, broader and more coarsely toothed, and the plant is only 1 to 3 feet high, mostly spreading over the ground. It is rather rare, but occurs in the Lower and Middle Districts, especially in Mecklenburg, where it was originally discovered by the elder Michaux. Pursh has represented it as being very poisonous, but it is perfectly harmless, as are all the preceding species.

5. POISON SUMACH. (*R. venenata*, DC.)—Found in all the Districts in cool swampy situations, where it is somewhat conspicuous by its smooth green bark and pink-colored leaf-stems. To most persons it is exceedingly poisonous, some even being affected by proximity to it, especially while rain or dew is evaporating from it. Others, however, can handle it with safety. The juice of this is a good varnish, like that of the *Japan Sumach*, (*R. vernicifera*), which is a very similar, and was once supposed to be the same species.

6. POISON OAK. (*R. Toxicodendron*, Linn.)—A small shrub, 1 or 2 feet high, well known by this name from the coast to the lower part of the Upper District. It is less poisonous than No. 5, but is too mischievous to be meddled with by persons who are sensitive to this class of poisons. The juice is an indelible Ink upon linen.

It has been stated very positively in some quarters, that the dreaded disease, known in our Mountains and at the West by the name of *Milk Sickness*, is caused by the cattle eating of this Poison Oak. But our Lower and Middle Districts abound in this plant, where this disease is not now heard of, while in those portions of the Mountains where cattle are affected with it, and which I have examined with special reference to ascertaining its origin, this

plant is not found, nor any other poisonous plant which is not common elsewhere. Besides, it is well known that cattle do not take the disease if kept from those grounds till the dew has evaporated. Its cause is yet a mystery, but I am satisfied it is telluric.

The *Mountain Tea* or *Wintergreen*, (*Gaultheria procumbens*, Linn.) so well known in the Mountains, rarely in the other Districts, for its aromatic spicy leaves and berries, is an evergreen shrub, but so small that it would not generally be considered such.

The next two genera have a *fleshy fruit*, but too large to come under the class of Berries. They are well known by their names.

1. PAPAWE. (*Asimina triloba*, Dunal.)—Not uncommon in rich bottom lands of the Middle District, 10 to 15 feet high, but in the primitive soil of the Western States sometimes 30 feet. The flowers are dull dark-purple, over an inch wide. The fruit is about 3 inches long by $1\frac{1}{2}$ thick, yellow, and filled with a soft sweet pulp which is edible, but does not seem to be agreeable to most persons. The bark of the trunk and root exhales a very heavy unpleasant odor. The wood is remarkably light and spongy.

2. DWARF PAPAWE. (*A. parviflora*, Dunal.)—A small shrub similar to No. 1, but smaller every way, found in waste grounds in the Lower District, and in thin woods of the Middle and lower part of the Upper District. It is from 2 to 5 feet high, the leaves 4 to 6 inches long, (about half the size of the preceding,) the greenish-purple flowers $\frac{1}{2}$ inch long and of unpleasant odor. Fruit in clusters, about an inch long.

1. SPANISH BAYONET. (*Yucca aloifolia*, Linn.)—A native of the coast from North-Carolina southward, frequently cultivated in the Lower District, and very showy when capped by its large cluster of white bell-shaped flowers. It is 4 to 8 feet high, its stiff leaves (12 or 18 inches long,) tipped with a very sharp thorny point, and their edges very rough.

2. (*Y. gloriosa*, Linn.)—Found also on the sandy coast, similar to the preceding, but smaller, and the leaves smooth on the edges.

3. BEAR GRASS. (*Y. filamentosa*, Linn.)—Common in sandy fields nearly throughout the State, well known by the thread-like

filaments on the edges of the leaves, and admired for the beauty of its flowers, borne in clusters upon a naked stem 4 to 6 feet high.

The two next genera would be most generally ranked among *Stone-fruit*, though the shell of the second is very thin, and covered by a very thin flesh.

FRINGE TREE. (*Chionanthus Virginica*, Linn.)—Sometimes called *Old Man's Beard*. We have no shrub of softer and more delicate beauty than this, when draped in its clusters of snow-white, fringe-like flowers. It is found northward to southern Pennsylvania. In this State it grows in all the Districts, but most abundantly in the Middle. It is sometimes 15 or 20 feet high, but flowers at the height of 2 or 3 feet. Its fruit has the appearance and odor of a green plum, but I have never seen it produce fruit in the Lower District. An infusion of the roots is a favorite remedy in long standing intermittents and other chronic diseases.

OIL-NUT. BUFFALO TREE. (*Pyralia oleifera*, Gray.)—A bush 3 to 6 feet high, abundant through our mountain range, and reaching north to the Mountains of Pennsylvania. The leaves are 3 or 4 inches long, becoming smooth, rather acrid to the taste, and oily. The fruit is an inch or more long, pear-shaped or roundish, with a thin shell and large oily kernel. The root has an unpleasant odor.

The remaining shrubs, including those with Nuts, are *dry fruited* and very various. The first GROUP will include such as have dry seed-covers, containing small seeds and opening by partitions. The first three genera have tubular small flowers like those of the Huckleberry and Sorrell Tree.

1. FETTER-BUSH. (*Andromeda nitida*, Bartr.)—Found only in the Lower District in low Pine barrens. It is 2 to 5 feet high, with the branches three-angled, smooth throughout; the leaves ever-green and shining and rather thick, 1 to 2 inches long, not toothed; the flowers clustered in the forks of the leaves, white or reddish, with a sort of honey odor, opening in March and April.

2. STAGGER BUSH. (*A. Mariana*, Linn.)—Grows in the Lower and Middle Districts, on the margin of low grounds. It is 2 or 3 feet high and smooth. The leaves are 1 or 2 inches long, not toothed, dull green; the flowering branches generally destitute of

leaves; the flowers in clusters along the branches, near $\frac{1}{2}$ inch long, white and showy, opening in April and May.

3. (*A. speciosa*, Michx.)—A very handsome shrub growing in low wet grounds of Pine barrens in the Lower District, 2 to 5 feet high and smooth. The leaves are 1 to $1\frac{1}{2}$ inch long, toothed, dull green, sometimes covered on the underside with a very white bloom. The flowering branches are free from leaves, 6 to 12 inches long and very showy. The flowers are larger than in No. 2, more bell-shaped, opening in May.

4. PEPPER BUSH. (*A. ligustrina*, Muhl.)—This occurs in all the Districts, but only in the lower part of the Upper. It is 3 or 4 feet high, somewhat hairy. The leaves are about 2 inches long; sharp pointed, finely toothed, paler underside. The flowers are small, almost globular, scurfy, in small clusters that are leafy.

5. (*A. floribunda*, Pursh.)—Rather rare, and belonging to the Mountains, 4 to 8 feet high, the younger branches reddish and covered with scattered stiff hairs and glandular dots. The leaves are 1 to $1\frac{1}{2}$ inch long, evergreen and rigid, rounded at base, sharp at top, minutely scolloped, the youngest with short hairs on the margin; flowers in crowded leafy clusters.

1. DOG LAUREL. (*Lencothoe Catesbæi*, Gray.)—Found only in the Mountains where it is also called *Hemlock*, growing on the cool margins of streams. It is 2 to 4 feet high, the leaves evergreen, 3 to 5 inches long and 1 inch broad, with a long tapering point, prickly-toothed on the edges. Clusters of flowers in the forks of the leaves. A very pretty shrub.

2. (*L. axillaris*, Don.)—On the borders of streams and wet places in the Lower District, and very much like No. 1. But the leaves are less prickly-toothed, less tapering, 2 or 3 inches long, broader than in the preceding, the clusters of flowers longer, and the flowers longer.

3. (*L. racemosa*, Gray.)—Grows from the coast to the base of the Mountains, 4 to 8 feet high, on the borders of wet places. The leaves are rather thin, acute, finely toothed, 1 to $1\frac{1}{2}$ inch long. The flowers ($\frac{1}{2}$ inch long,) are on terminal straight branchlets, all hanging to one side, and looking like rows of teeth, the rows being 2 or 3 inches long.

4. (*L. recurva*, Gray.)—Discovered by Mr. Buckley in the Mountains near Paint Rock. It is 3 or 4 feet high, the leaf and flower-branches recurved; the leaves broader and more hairy than in No. 3, rounded at base, finely toothed, scarcely tapering, 2 or 3 inches long, deciduous as in No. 3.

(*Cassandra calyculata*, Don.)—A small shrub, 2 or 3 feet high, growing in damp grounds of the Lower District, and not unlikely in the others. The evergreen leaves are about 1 inch long, $\frac{1}{2}$ inch wide, finely toothed, rather stiff, and covered, like the young branches, with small white scales. The flowers are on terminal branchlets; quite small, solitary in the forks of small leaves.

1. LAUREL. (*Rhododendron maximum*, Linn.)—This is rare north of Pennsylvania, but becomes abundant southward in the Alleghanies, and is common through their whole range in this State, where it often forms impenetrable thickets, many acres in extent. It also grows upon rocky hills in the Middle District as far east as Orange. Its usual height is 8 or 10 feet, but is sometimes as high as 20 feet. This is a production of great beauty and universally admired. The flowers, about an inch broad, grow in compact clusters on the ends of the branches, and are generally of a pale rose color, but sometimes whitish, dotted with green and yellow on the inside. These contrast pleasingly with the large thick evergreen leaves. The leaves and flowers are reputed poisonous. The wood is very hard and fine grained, but not equal to that of Ivy.

2. OVAL-LEAVED LAUREL. (*R. Catawbiense*, Michx.)—This splendid Laurel is chiefly confined to the highest summits of our mountains, but is said to extend somewhat into Virginia. It is often confounded with the preceding, but besides its different locality, growing only on the tops of such Mountains as the Roan in Yancey and Negro Mt. in Ashe, it blossoms earlier than the other, though at a higher elevation, has larger and more intensely colored flowers, and shorter and broader leaves. It is 6 or 8 feet high, and handsomer than No. 1. It stands cultivation pretty well in the Middle District.

3. DWARF LAUREL. (*R. punctatum*, Andr.)—A rusty looking shrub, 1 or 2 feet high, chiefly confined to the mountains of North-Carolina and Georgia. It has a strong family likeness to the other

species, but is too inferior to them in every respect to attract or deserve much attention. I have met with it only on Table Rock, Jonas' Ridge and Whiteside Mountain.

1. SMOOTH HONEYSUCKLE. (*Azalea arborescens*, Pursh.)—Found only along water courses in the lower part of the Upper District, and is 4 to 10 feet high. It is similar to the next, a common and well known species; but this has smooth branchlets, leaves of brighter green above, and long calyx appendages at the base of the flower. The flowers are white and roseate, and their odor may be perceived at a great distance; this being the most powerfully fragrant of our Honeysuckles. For cultivation this will rank next in beauty to the *Yellow Honeysuckle*.

2. CLAMMY HONEYSUCKLE. (*A. viscosa*, Linn.)—Very common through the State, 2 to 6 or 8 feet high, the branchlets bristly, and the flowers covered with clammy hairs. The flowers are white or flesh-colored and very fragrant. In this and No. 1 the flowers appear after the leaves have expanded. In the next two species they appear before or with the leaves.

A variety of this (var. *glauca*,) occurs with paler and rougher leaves, their underside covered with a white bloom.

3. PURPLE HONEYSUCKLE. (*A. nudiflora*, Linn.)—Very common in great varieties of soil through the State, 2 to 6 feet high, but usually very small in poor dry soils. The flowers vary from a flesh color to pink or purple, and are sometimes quite white. They are destitute of fragrance.

4. YELLOW HONEYSUCKLE. (*A. calendulacea*, Michx.)—This is found only at a considerable elevation on our Mountains, where it is abundant and well known by the name here given. It is commonly from 3 to 6 feet high, and varies very much in the color of its flowers, but most frequently they are some shade of yellow. Bartram, in his "Travels," calls this the *Fiery Azalea*, and says: "This epithet *Fiery* I annex to this most celebrated species of *Azalea*, as being expressive of the appearance of its flowers, which are in general of the color of the finest Red Lead, orange and bright gold, as well as yellow and cream color. These various splendid colors are not only in separate plants, but frequently all the varieties and shades are seen in separate branches on the same plant, and the clusters of blossoms cover the shrubs in such in-

credible profusion on the hill sides, that suddenly opening to view from dark shades, we are alarmed with the apprehension of the woods being set on fire. This is certainly the most gay and brilliant flowering shrub yet known."

1. **IVY.** (*Kalmia latifolia*, Linn.)—A beautiful shrub known from New England to Georgia, either by the above name, or as *Laurel*, *Mountain Laurel* and *Calico Bush*. In this State it is known under the first and last names, the first being most in use. It is most abundant in the Mountains, but is found along streams and on rocky hills of the Middle District, extending somewhat into the Lower, even into the Dismal Swamp. This, in combination with the *Laurel*, which often accompanies it and blossoms at the same time, presents a scene of floral beauty rarely equalled in this country. Like the *Laurel*, this is an evergreen, and forms also impenetrable thickets, but its leaves are shining, much darker and smaller. It is 10 to 15 and even 20 feet high.

The leaves are poisonous to cattle, and a snuff made from them is a powerful sternutatory. An ointment made from the powdered leaves has been successfully used for scald heads. The wood, particularly of the roots, is exceedingly hard, fine grained, marked with red lines, and capable of a good polish. We have hardly any wood better adapted for the handles of tools, small screws, and similar articles. This and the *Laurels* can be raised from seeds.

2. **WICKY.** (*K. angustifolia*, Linn.)—This has an extensive range over the United States. In this State it is common on the small Pine-barren swamps of the Lower Districts, but is rare in the others. It is 1 to 3 feet high; the leaves 1 or 2 inches long and $\frac{1}{2}$ inch wide, pale green, paler underneath; the flowers roseate or crimson, about $\frac{1}{2}$ inch broad, being one-third the size of the preceding, but of the same elegant form, and growing in clusters along the branches. This is a beautiful undershrub and is greatly improved by cultivation. It is a poisonous plant, especially to sheep, and is in some places called *Sheep Laurel*. A decoction of the leaves is a domestic remedy for cutaneous diseases in man and beast.

3. (*K. cuneata*, Michx.)—Similar to the *Wicky*, found in the Lower District, but very rare. It may be distinguished from that by the flowers being white at top and red at bottom, and by the

leaves being scattered along the branches, instead of growing in circles of three, as in No. 2.

SAND MYRTLE. (*Leiophyllum buxifolium*, Ell.)—A small ever-green shrub, 6 to 12 inches high, looking somewhat like the Garden *Box*, with small, dark green leaves, and small white flowers clustered on the ends of the branches. It grows in sandy woods of Brunswick county, and on the rocky summits of our Mountains, from the Grandfather to Whiteside.

FALSE HEATH. (*Menziesia globularis*, Salisb.)—Common on the higher Mountains, 3 to 6 feet high, with thin, hairy, deciduous leaves, and small, reddish, bell-shaped flowers, like those of a *Huckleberry*, and a small, woody seed-vessel, like those of *Andromeda*, &c.

1. WHITE ALDER. SWEET PEPPER BUSH. (*Clethra alnifolia*, Linn.) Grows near damp places in the Lower and Middle Districts, 2 to 4 feet high. The leaves are a little like those of the common *Alder*, but are smaller and narrower. The flowers are small, white, and very fragrant, terminating the branches in racemes which are 2 or 3 inches long. A form of this (var. *tomentosa*,) has leaves with a white down on the underside.

2. MOUNTAIN PEPPER BUSH. (*C. acuminata*, Michx.)—Quite an ornamental shrub, 10 to 15 feet high, growing in the Mountains from Ashe to Cherokee. Its leaves are thin, pointed, fine-toothed, and 5 or 6 inches long. The racemes of white flowers are larger than in No. 1, and drooping.

(*Itea Virginica*, Linn.)—At a little distance this has some resemblance to the *White Alder*, but with a smoother aspect, and the flowers are not fragrant. It belongs to the borders of wet places from the coast to Lincoln, is 4 to 8 feet high, and has small white flowers in drooping racemes, which are 3 to 5 inches long on the ends of the branches.

1. WILD HYDRANGEA. (*Hydrangea arborescens*, Linn.)—A smooth shrub, 2 to 5 feet high, growing along streams and on mountain and hill sides of the Upper and Middle Districts. The

leaves are 3 to 5 inches long, heart-shaped, pointed, toothed. The flowers are whitish, in flat-topped clusters, some of those on the margin being large and showy like those of the cultivated Hydrangea.

2. SNOWY HYDRANGEA. (*H. radiata*, Walt.)—Found only on the mountains west of the Blue Ridge from Yancey to Georgia. North of this, it has not, I think, been detected. It is from 3 to 6 or 8 feet high. The leaves are heart-shaped, 4 to 6 inches long, the underside clothed with a thick, silvery-white down. The barren flowers, which give this genus the peculiarity for which it is admired, are in this species found only around the border of the flat-topped cluster, but are said to become much more abundant in cultivation. They are of a pure white, an inch or more broad. This pretty shrub would be much prized in gardens, if there were not some more showy species in cultivation.

1. SYRINGA. (*Philadelphus grandiflorus*, Willd.)—This very ornamental shrub, now common in our yards and gardens, prized for its graceful, slender branches, and snow-white flowers, does not appear to be abundant in this State. I am acquainted with but a single locality of it, which is in Hickory Nut Gap; though it is doubtless to be found along other streams in the upper part of the State. It is 6 to 10 feet high, the leaves about 2 inches long, pointed, with few distant teeth, rather soft and hairy, and tasting somewhat like Cucumbers. The flowers are an inch or more broad.

2. ROUGH SYRINGA. (*P. hirsutus*, Nutt.)—Every way smaller than No. 1, the leaves quite rough on the upper side and whitish-downy beneath. This grows on the French Broad River, a few miles below Asheville.

1. MOCK ORANGE. (*Styrax grandifolia*, Ait.)—A very beautiful shrub, 3 to 12 feet high, with rather large leaves, 3 to 6 inches long, and of a grayish aspect from the presence of a whitish down on their underside. The flowers are from 15 to 20 on loose nodding racemes, white, very fragrant, in size and form very similar to those of the Orange. It grows on light rich soils in the Lower and Middle Districts, as far west as Lincoln. This is well worthy of a place in shrubberies, but has received but little attention.

2. (*S. Americana*, Lam.)—Distinguished from No. 1 by its smooth green leaves, 1 or 2 inches long, and smaller flowers, only 3 or 4 on a raceme. It is 4 to 8 feet high, not inelegant, but of inferior beauty to the other, and grows on the borders of swamps in the Lower District.

1. BUSH HONEYSUCKLE. (*Diervilla trifida*, Mærch.)—A small, rather delicate shrub, 3 to 5 feet high, with pointed toothed leaves which are 3 or 4 inches long, and have short footstalks. The flowers are in clusters of (generally) 3 in the forks of the upper leaves, greenish yellow, and funnel-shaped, like those of the *Woodbine*. This is found only in the Mountains.

2. (*D. sessilifolia*, Buckley.)—Like the preceding, but larger in several particulars, and the leaves clasp the branches, being destitute of a footstalk. Found in the Mountains.

1. STRAWBERRY BUSH. (*Euonymus Americanus*, Linn.)—A shrub 2 to 5 feet high, found in all the Districts and known by the names of *Burning Bush*, *Fish-wood* and *Bursting Heart*, besides the one first given. The branches are square, straight but flexible, very smooth, and about as green as the leaves. The flowers are small, purplish or greenish, and unattractive. The fruit gives the plant a peculiar beauty, for which chiefly it is prized in Shrubberies. This is of a bright crimson color when mature, and covered with small warts which give it somewhat the aspect of a small Strawberry. This finally bursts open exposing its bright scarlet seeds.

2. BURNING BUSH. (*E. atropurpureus*, Jacq.)—Every way larger than the preceding, its flowers dark-purple, and the fruit smooth. I have not met with it, and am indebted to Prof. Mitchell for my knowledge of it as an inhabitant of this State.

(*Stillingia ligustrina*, Michx.)—A shrub with slender spreading branches, 6 to 12 feet high, very rare in this State, and not found, I think, north of Cape Fear River. The leaves are 1 to 3 inches long, not toothed, the upper end obtuse, tapering at the lower end, and with a short footstalk. For my knowledge of this plant I am under obligations to Dr. McRee. The *Tallow Tree* (*S. sebifera*), cultivated farther south, and the *Queen's Delight*, (*S. sylvatica*), an herbaceous plant of the Pine barrens, are members of this genus.

1. (*Stuartia Virginica*, Cav.)—This and the *Loblolly Bay* are the only representatives in this country of the admired *Camellia* family, and the still more important *Tea Plant*. It is one of our most beautiful shrubs, and yet has nowhere, so far as I know, obtained a popular name. It is found in rich soils in the eastern half of our Lower District, extending north into Lower Virginia, and southward to Florida. It is 6 to 15 feet high, blossoming in April and May. The flowers are white, about the size of the Cherokee Rose, silky on the outer side, covered on the inner with a circle of stamens with bright purple filaments and blue anthers.

2. (*S. pentagyna*, L'Her.)—Like the preceding, without a name. It is similar to the preceding, only its flowers are cream-colored and its staminate filaments are white. Found in the Middle and Upper Districts, from Wake to Cherokee. The seed vessel in these two is an ovoid woody capsule.

TOOTHACHE TREE. (*Zanthoxylum Carolinianum*, Lam.)—Known also by the names of *Pellitory* and *Prickly Ash*. The last name, though more legitimate in this application, is generally appropriated in this State to another plant before described. It is a small branching tree, 12 to 20 feet high, the old bark covered with prickles, and peculiar to the southern sea coast. The bark, leaves and fruit, are aromatic and intensely pungent, producing a rapid secretion of saliva, and are a popular and useful application for toothache. They would probably be generally serviceable as a counter irritant.

1. HARDHACK. (*Spiræa tomentosa*, Linn.)—An erect branching pretty shrub, 2 or 3 feet high, common in low wet places of the Lower and Middle Districts, and the lower part of the Upper. The leaves are 1 to 1½ inch long, oblong, coarse toothed, the under-side coated with a rusty-white down. The flowers are rose-colored, small, clustered on the ends of the branches in a compound raceme 3 or 4 inches long.

2. QUEEN OF THE MEADOW. (*S. salicifolia*, Linn.)—This is similar to No. 1, and sometimes called *Meadow Sweet*, but is taller and the flowers generally white. The leaves are larger, smoother and thinner. It belongs to damp bushy places in the Middle District, and in valleys and along streams in the lower part of the Upper.

3. NINE BARK. (*S. opulifolia*, Linn.)—This is found upon river banks in the western part of the State, 6 to 10 feet high, with slender curved branches, often spreading like a vine over other shrubs, and covered with a profusion of flat clusters of small, white, but not showy flowers. Leaves about 2 inches long and broad, divided into 3 segments and coarsely toothed. The reddish fruit is membranaceous, composed of 3 to 5 sacs united at base. The old bark peels off in thin layers.

YELLOW ROOT. (*Zanthorhiza apiifolia*, L'Her.)—A small shrubby plant, 1 or 2 feet high, generally spreading on the ground, found on moist rocky hill-sides of the Middle and Upper Districts. The leaves are dark green and divided somewhat like those of Parsley. The flowers are small, dark purple, in loose slender clusters, appearing before the leaves. The roots are intensely bitter, of a yellow color, and were used by the Indians in making a yellow dye.

RED ROOT. (*Ceanothus Americanus*, Linn.)—Common in dry woods from the coast to the mountains, 1 to 3 feet high, and the ends of the numerous small branches having loose clusters (1 or 2 inches long,) of small white flowers supported on white footstalks. The leaves are 1 or 2 inches long, sharply toothed, and have 3 prominent veins. The root is dark red and quite astringent, and is frequently used in infusion, tincture, or powder, where astringency is required. It is said also to furnish a dye of a cinnamon color. The dried leaves served as a substitute for Tea during the Revolution, and hence got the name of *New Jersey Tea*. It is said to be quite as good as some of the Black Teas.

1. INDIGO BUSH. (*Amorpha fruticosa*, Linn.)—A very pretty shrub, 6 to 15 feet high, growing upon streams in all the Districts, but more frequent in the Lower. The flowers are small, dark-purple, crowded on spikes which are 3 or 4 inches long and clustered together. It is said to have been used for the manufacture of Indigo, but, I imagine, with not much profit.

2. DWARF INDIGO BUSH. (*A. herbacea*, Walt.)—Like No. 1 in its whole habit, but only 2 or 3 feet high, of a grayish aspect, and with the flowers whitish or pale-blue. It is frequent in the barrens

of the Lower District. The leaves in these two species are *pinnate*, like those of the Locust and Hickory. The fruit is a very small pod, sprinkled with glands.

HE HUCKLEBERRY. (*Cyrilla racemiflora*, Walt.)—This is an absurd name, but I have never heard any other. This smooth shrub inhabits the borders of swamps and branches in the Lower District, and is 10 or 15 feet high. The leaves are oblong, shining, 2 or 3 inches long. The small white flowers grow on racemes that are 3 to 5 inches long, and that are clustered on the ends of the previous year's growth, and make this quite ornamental. The bark at the base of the trunk pulverizes naturally, and is much used as a styp-tic and in applications to old ulcers.

(*Buckleya distichophylla*, Torr.)—A smooth shrub, about 6 feet high, with slender grayish branches, known only upon the streams of this State that flow westward, as the Pigeon and French Broad Rivers. Its thin delicate foliage reminds one by its general aspect of the English and Catalonian Jasmine of our gardens. The flowers are greenish and inconspicuous. The fruit is about $\frac{1}{2}$ inch long, growing solitary on the end of a branch.

(*Darbya umbellulata*, Gray.)—Like the preceding, a very rare plant, as yet known only in two or three localities in Georgia, and in the bend of the Catawba, near Lincolnton, in this State. It is 1 or 2 feet high, with opposite branches and leaves, the latter ovate, acute, entire, 1 or 2 inches long, 1 to $1\frac{1}{2}$ wide, rounded at base, and with short foot-stalks. The flowers are small, greenish, in a cluster of 3 to 8, which is borne on a foot-stalk in the forks of the leaves.

WITCH HAZEL. (*Hamamelis Virginica*, Linn.)—Well known by this name through the State. It has the peculiarity of flowering late in the Fall after the leaves have dropped, and maturing its fruit in the following Spring. Its popular name is derived from the use made of its branches in discovering hidden Springs of water, minerals, &c. Other kinds, as of the Peach, are indeed sometimes used for this purpose, but I venture to affirm that none in the whole vegetable kingdom are better than those of *Witch Hazel*.

DWARF ALDER. (*Fothergilla alnifolia*, Linn.—Unknown north of Virginia. In this State it is found from the coast to Lincoln. In the Lower District it is 1 or 2 feet high, often but a single unbranched stem, terminated by a tuft of small white flowers before the leaves appear. It grows here upon the borders of Pine-barren swamps, and is rarely much branched. In the Middle District it is found upon rocky hills, is 3 to 5 feet high, forming a branched straggling shrub. The foliage varies a good deal, so that several species have been made of it by some authors; but the leaves are generally not unlike those of *Alder*. The fruit is a hard capsule, like that of *Witch Hazel*, and, like that, bursting elastically and expelling the hard bony seeds to a considerable distance.

SWEET FERN. (*Comptonia asplenifolia*, Ait.)—A small shrubby plant, 1 or 2 feet high, with leaves (3 or 4 inches long,) much resembling some of the Ferns, and possessing a grateful aromatic odor like that of the *Wax Myrtle*. It is found chiefly on rocky or gravelly hills of the Upper and Middle Districts, but is occasionally found in dry and sandy woods in the upper part of the Lower. An infusion of this plant is a popular remedy for dysentery.

WAX MYRTLE. CANDLE-BERRY MYRTLE. (*Myrica cerifera*, Linn.)—A well known shrub with fragrant leaves, common in the Lower District, and found in fruit from 1 to 18 feet in height. The small berry-like nuts, which often hang two or three years on the branches, are covered with a fragrant wax which has been used in the manufacture of soap and candles. The latter burn long and diffuse an agreeable odor. A decoction of the berries has been used for Tetters and similar affections. The root is said to be a specific for tooth-ache.

1. **HAZEL NUT.** (*Corylus Americana*, Walt.)—A shrub 4 to 8 feet high, found in our Mountains, and extending north to New England. The nut is much esteemed, but is smaller and harder shelled than the European Hazel or *Filbert*, (*C. Avellana*.)

2. **BEAKED HAZEL NUT.** (*C. rostrata*, Ait.)—Of similar size and range with the preceding; but this has the husk of the fruit prolonged into a beak or horn, and it extends into the Middle District as far down as Orange.

The remaining shrubs are so various in their fruit and general habit, that, to save space, they are here grouped miscellaneously together, most of them being well known by their popular names.

BUTTON BUSH. BOX. (*Cephalanthus occidentalis*, Linn.)—Common on the borders of streams and swampy grounds in the Lower and Middle Districts, always easily recognized by its round head of small white flowers, which is about an inch in diameter. It is 3 or 4 feet high, and very pretty when in blossom. The inner bark of the roots is an agreeable bitter, and is used for relieving obstinate coughs.

1. **SHRUBBY TREFOIL. HOP TREE.** (*Ptelea trifoliata*, Linn.)—A shrub 4 to 8 feet high, belonging to the upper part of the Middle District, with trifoliate leaves like those of Clover, the leaflets 2 or 3 inches long, somewhat hairy when young, pale on the underside. The flowers are small, greenish-white, in rather flat clusters, heavy-scented, which are succeeded by a flat, winged fruit, like that of the Elm, but an inch broad. The fruit is bitter, and used as a substitute for *Hops*.

2. **DOWNY HOP TREE.** (*P. mollis*, M. A. C.)—Every way smaller than No. 1, and found only in the Lower District. Its leaves are more rigid, and the underside covered with a permanent, white, soft, silky down.

BLADDER NUT. (*Staphylea trifolia*, Linn.)—An interesting shrub, 5 to 10 feet high, with greenish, striped branches, trifoliate leaves, the leaflets 2 to 4 inches long, taper-pointed, finely toothed, and smooth. The small white flowers are gathered into loose pendulous clusters, which are succeeded by 3-angled bladder-like pods about 2 inches long. I have met with this only near Hillsborough and Chapel Hill, but it is probably to be found along streams through the Middle District.

1. **SWEET SHRUB.** (*Calycanthus floridus*, Linn.)—This plant, now so extensively cultivated, and admired for the rich Strawberry odor of its flowers, is a native of the southern Alleghanies. This species may be known by the soft down on the underside of the leaves, and on the branchlets, &c. The fruit of this genus is a

sort of thick-skinned, bladdery sac, $1\frac{1}{2}$ inches long, containing large seeds.

2. (*C. lævigatus*, Willd.)—The leaves of this are taper-pointed, smooth and green on both sides, sometimes a little rough above and pale beneath. This is found in the Mountains, and in the Middle District as low down as Orange.

3. (*C. glaucus*, Willd.)—This is found from Lincoln westward, and may be recognized by the white under-surface of the leaf; a little rough on the upper.

1. ALDER. (*Alnus serrulata*, Ait.)—Common on small streams all over the State, and too well known by the above name to need a description.

2. MOUNTAIN ALDER. (*A. viridis*, DC.)—Like the above in habit and general characters, but the underside of the leaves covered with a soft gray down. It is known at the South, only upon the top of Roan Mountain, from whence to northern New York it is not found. It occurs in Europe.

1. GROUNSEL. (*Baccharis halimifolia*, Linn.)—Grows in both brackish and fresh swampy grounds of the Lower District. It is 6 to 12 feet high, of an ashy hue from the whitish scales that cover the bark and leaves. The small flower-heads are solitary, or a few clustered together, borne on a foot-stalk. The long, white, silky hairs of the seeds emerging from the heads give the plant a pleasing appearance in the Fall.

2. (*B. glomeruliflora*, Pers.)—Like the preceding, but rarer and less showy, and has larger clusters of flower-heads, destitute of the footstalk.

3. (*B. angustifolia*, Michx.)—Found in brackish marshes, 4 to 8 feet high. The leaves, which, in the other species, are half as broad as long, and toothed, are in this linear and entire.

1. MARSH ELDER. (*Iva frutescens*, Linn.)—A coarse unsightly shrub of our salt-marshes, 4 to 6 feet high. The whole plant is smoothish, and its leaves lance-shaped, toothed, and about 2 inches long. The flower-heads are greenish and unsightly in the forks of the small leaves on the terminal branchlets.

2. (*I. imbricata*, Walt.)—This grows upon the sea-beach, and is but partly shrubby, 3 or 4 feet high. The leaves are very thick and fleshy, 1 to $1\frac{1}{2}$ inch long, rarely toothed, and wedge-shaped. The plant has a strong odor like old honey.

SWAMP LOOSESTRIFE. (*Nesaea verticillata*, H. B. K.)—A half shrubby plant found in branch-swamps of the Lower District, 4 to 6 feet high, with slender, curved, 4 to 6-sided stems. The leaves are 3 or 4 inches long, narrow like those of a Willow, generally growing around the stem in a circle of three. The flowers are clustered in the forks of the leaves, about $\frac{1}{2}$ inch wide, purple or roseate, very pretty, reminding one of the blossoms of the *Lagerstræmia* or Crape Tree.

ARBOR VITÆ. (*Thuja occidentalis*, Linn.)—This has its Southern limit on the Mountains in the north-western part of the State. From thence through the Mountains of Virginia it becomes more common. It is but a shrub or small tree at the South, but farther North it attains a height of 50 feet, and its timber is used in building and for cabinet work.

1. CANE. (*Arundinaria gigantea*, Chapm.)—This belongs to the *Grass* family, but, being of woody texture, falls within our arrangement. It is 10 to 15 or 20 feet high, found along the river bottoms of the Cape Fear. I am not aware of its existence North of that limit. According to Dr. Chapman, "it is simple the first year, branching the second, afterwards at indefinite periods fruiting, and soon after decaying." The value of the stems for fishing rods is well known.

2. REED. (*A. tecta*, Muhl.)—This is the common smaller form, 2 to 10 feet high, and found in low grounds in each District.

This completes the list of the SHRUBS of North-Carolina, so far as they are known to me, with the exception of the following, which are too small and obscure to merit more than a bare enumeration:

HYPERICUM. Of this we have five woody species, all with yellow flowers, one of which (*H. prolificum*,) is occasionally cultivated under the name of *Rock Rose*.

FLOWERING MOSS. (*Pyxidanthera barbulata*, Michx.)—A very pretty, small, trailing evergreen, with white flowers which appear in early Spring, and looking somewhat like a Moss in the absence of blossoms. Belongs to the damp Pine-barrens and Savannas of the Lower District.

ASCYRUM. Much like the preceding, also with yellow flowers.

HUDSONIA. Only 3 or 4 inches high, also with yellow flowers, of which no locality is anywhere known but on Table Rock, N. C.

TRAILING ARBUTUS OR GROUND LAUREL. (*Epigæa repens*, Linn.) Common.

POLYGONELLA. In the sandy Barrens about Wilmington.

It may be interesting to append here a comparative view of the Flora of North-Carolina with that of the Northern and Southern States, east of the Mississippi. In Prof. Gray's Manual of Botany, which includes the States north of North-Carolina and Tennessee, I find described 130 Trees, 183 Shrubs, and 30 vines. In Dr. Chapman's Flora of the Southern States are described 126 Trees, (of which there are 112 in North-Carolina,) 224 Shrubs, (176 of them in North-Carolina,) and 46 Vines, (32 in this State.)

THE VINES

OF

NORTH-CAROLINA.

These will be grouped according to the character of their fruit; the first eight genera having *Berries*; the next five, *Pods*; the next three, *dry Capsules*; and the remaining two, naked *Feathered Seeds*.

GRAPES.

1. SUMMER GRAPE. (*Vitis æstivalis*, Michx.)—Common, as are the other species, excepting the *Muscadine*, in most parts of the United States. In this State it is found in all the Districts, generally near streams, but sometimes in dry woods, climbing over trees from 30 to 50 feet. The leaves are 4 to 6 inches broad, cut into 3 or 5 divisions, the underside clothed with a reddish, cobweb-like down when young, which mostly falls away in the course of the season. The bunches of fruit are compound, 6 to 8 inches long, the berries $\frac{1}{8}$ to $\frac{1}{2}$ inch thick, purplish, blackish or bluish, with a bloom; very varying in flavor, frequently very fine.

According to H. W. Ravenel, Esq., of Aiken, South-Carolina, who is a good Botanist, as well as a successful cultivator of Grapes, the following cultivated varieties are descended from this species: The *Warren*, *Pauline*, *Herbemont*, *Guignard*, *Clinton*, *Ohio*, *Marrion*, *Treveling*, *Long Grape* or *Old House*, *Elsinborough*, *Seabrook* and *Lenoir*. With this last he identifies the *Black July*, *Devereux*, *Thurmond*, *Sumpter* and *Lincoln* Grapes. I find, however, that there is a difference of opinion in regard to the identity of the *Lenoir* and *Lincoln* varieties; some maintaining a perceptible difference, the latter being deemed superior to the other. Dr. C. L. Hunter, of Lincoln, who is paying much attention to Grape culture, especially of our native varieties, pronounces the *Lenoir* "one of the very best table Grapes," and recommends its general

cultivation. He informs me that this, as well as the *Warren*, came from Georgia.

I learn from the same gentleman, that the *Lincoln Grape* was discovered about the beginning of this century, near the junction of the South Fork and Catawba, by Dr. Wm. McLean, and that he transplanted the whole vine near his house. From this stock Mr. John Hart, of Mecklenburg, derived his, which is still in vigorous existence. From this last, Dr. Butt, of Lincolnton, obtained his cuttings, and sent some of the fruit to Longworth, who gave it the name, now most in use, of the *Lincoln Grape*, though it was previously known as the *Hart Grape*, and *McLean Grape*.

2. **FOX GRAPE.** (*V. Labrusca*, Linn.)—I have met with this only in the Middle District, where it is found in damp thickets, running from 15 to 25 or 30 feet. The leaves are roundish, about the same size as those of No. 1, but not so much divided, and covered underneath with a permanent thick down, which is generally white or gray, rarely of a faint rusty hue. The berries are larger than in that, being $\frac{1}{2}$ to $\frac{3}{4}$ inch in diameter, in small bunches, commonly dark purple, but sometimes amber-colored or whitish, and of various quality, mostly with a musky and rather hard pulp.

The cultivated varieties of this are, according to Mr. Ravenel, the *Isabella*, *Catawba*, *Bland's Madeira*, *Concord*, *Diana*, *Rebecca*, *To Kalon*, *Anna*, *Mary Isabel*, *Ontario*, *Northern Muscadine*, *Hartford Prolific*, *Catawissa*, *Garrigues*, *Stetson's Seedling*, *York Madeira*, *Hyde's Eliza*, *Union Village*, *Early Chocolate*, *Harvard*, *Early Black*, *Green Prolific Kilmington*. The first two in the list are, I believe, the most approved, and most extensively cultivated; both of which are said to have originated in this State.

A foreign origin has been claimed for the *Isabella*, but this is an evident error, proved in the fact that seedlings of the *Isabella* sometimes revert to our Fox Grape in every particular of leaf and fruit. This has been tested by Mr. Caradenc, of South-Carolina, as I learn from Mr. Ravenel. But what is regarded as a scientific demonstration of its American origin, is the fact that its seedlings sometimes have barren stocks, like all our American species, which is not the case with any European Grapes. Besides, the *Isabella*, in its specific characters, comes nearer to our Fox Grape than to any other.

Dr. Hunter, who has given much attention to the history of our Grapes, has communicated most of the following items in regard to

the Isabella. Dr. Laspeyre was probably its first cultivator in the United States, probably as early as 1805, as he sold it in the Wilmington Market in 1810. Judge Ruffin cultivated it in Orange County in 1811, under the name of *Laspeyre Grape*. It is a tradition that Gov. Smith brought it to Smithville in 1809. About the year 1810 Mrs. Isabella Gibbs took a rooted cutting from Gov. S's garden to Brooklyn, New York, according to a current account. According to Dr. Laspeyre, she got the vine from *him*. These statements may, in a sort, be reconciled, if Gov. S. obtained *his* stock from Dr. Laspeyre. In 1819, Gen. Swift bought the Gibbs place, and it was there the elder Prince first saw and obtained this Grape, which he named the *Isabella* in compliment to Mrs. Gibbs. Dr. Hunter has some of these statements from Gen. Swift. Dr. Laspeyre was under the impression, that this, which he called the *Black Cape*, was one of the vines which he brought from St. Domingo, but it was probably the accidental introduction of an American among his foreign stocks. Dr. Hunter seems to be of opinion, that it came to the Cape Fear region from South Carolina, according with the tradition mentioned in Dr. Hawks' History.

The *Catawba Grape*, as I am informed by Dr. Hunter, originated in Buncombe County on Cain Creek, an affluent of the French Broad. His views on "The Origin of the Catawba Grape" were given last year (1859) in an article for the American Farmer.

3. MUSCADINE. (*V. vulpina*, Linn.)—Known also as *Bullace*, *Bull Grape*, and *Bullet Grape*, and farther south as *Fox Grape*; in Florida, as *Mustang Grape*. It extends northward as far as Maryland and Kentucky, from whence southward it is one of the most common Vines. In this State it is found, in various soils, from the coast to Cherokee, but most luxuriant in light soils of the Lower District, covering the loftiest trees. The bark is pale and smooth, that of the smaller branches dotted with minute warts. The leaves are about 3 inches long, thin, smooth and shining, coarse-toothed, nearly round and heart-shaped. The berries are in small bunches, larger and thicker skinned than any of our other Grapes, varying in color from whitish through different shades of red and purple to ebony black. The quality of the fruit varies as much as its color, being now of a sharp acid flavor, and again of luscious sweetness.

The *Scuppernong*, now so famous as a Table and Wine Grape, is a variety of this species. There are still found in the Lower and

Middle Districts, especially in the former, wild vines bearing a whitish or amber berry, like the original *Scuppernong*, but of various qualities, as is the case with the colored kinds. Some of them are no better than the commonest *Muscadines*; and no one is superior, if equal, to the well known cultivated variety. Some of the dark *Muscadines* are very nearly as luscious as the *Scuppernong*, and have been brought under culture, as the *Mish Grape*, and *Alexander's Grape*, which are black, and also the *Bull's Eye*, so named from its superior size.

The *Hickman Grape* I take to be identical with the true *Scuppernong* and derived from Tyrrell County, the home of the original. For some of this information, as well as for the following history of the *Scuppernong* (proper,) I am indebted to Rev. E. M. Forbes, who has resided in the region and has taken much pains to obtain an authentic account of this Vine. Two men, of the name of Alexander, while clearing land near Columbia, the county seat of Tyrrell, which stands on the east side of *Scuppernong River*, discovered this Grape, and were so much pleased with it, that they preserved the Vine and the tree upon which it grew. "That was the Vine which I saw," says Mr. Forbes, "and from which other Vines were propagated." They called it the "White Grape," and from it made what they called "Country Wine." At the suggestion of a relative, who had been in the Mediterranean, and knew the indefiniteness of such names as these, they subsequently named the Grape from the River upon which it was found. "This is the history given by a grand-daughter of one of the discoverers, who was alive when I first went to *Scuppernong*."

A tradition is furnished me by Dr. Hunter, that "about the year 1774, the Rev. Charles Pettigrew found it on the low grounds of *Scuppernong River*, and planted out several vines." My limited space will not permit an exhaustive discussion of this matter here, and I will, therefore, only remark further upon it, that the notion of its origination on Roanoke Island seems opposed by the name of the Grape. I have also been told by those who have been on the Island, that there are no Vines of it there, which were not evidently transplanted there.

4. FROST GRAPE. WINTER GRAPE. (*V. cordifolia*, Michx.)—Common in thickets along streams through the Middle District. The leaves are 3 to 5 inches broad, thin, smooth, toothed, and some-

times cut into three segments. The berries are nearly black, small, $\frac{1}{4}$ inch thick, and very sour until dead ripe. The berries are sometimes greenish-white, and Lawson mentions a white [whitish?] variety. I have not heard of this being cultivated.

5. (*V. bipinnata*, Torr. & Gr.)—This would not generally be taken for a member of this genus, either from its leaves, which are compound, like those of the China Tree, or from its fruit, which is uneatable. The berries are blackish, slightly hairy, and about the size of a small Pea. It is found in the Lower and Middle Districts, growing in rich soils, climbing (without tendrils) over shrubs and small trees.

VIRGINIAN CREEPER. (*Ampelopsis quinquefolia*, Michx.)—This pretty Vine, sometimes cultivated, is found along fence-rows and borders of woods in all parts of the State. It may be known by its leaflets growing in *fives* from the end of a common leaf-stalk, as in the Buckeye, which is the case with no other of our Climbers. The foliage becomes crimson in the Fall. The berries are dark-blue, about the size of a small Pea, borne on bright crimson foot-stalks. The rapidity of its growth renders this Creeper useful for covering old walls, &c., like the English *Ivy*. It is, indeed, sometimes called *American Ivy*. This is often confounded with the *Poison Vine*, though having very little likeness to it, and is hence avoided, though it be quite innocent.

1. WOODBINE. (*Lonicera sempervirens*, Ait.)—This beautiful vine, now common in cultivation, grows from the coast to the Mountains. The flowers are tubular, 1 to 2 inches long, scarlet without and yellow within. In rich soils it has a very luxuriant growth, climbing high into forest trees.

2. YELLOW WOODBINE. (*L. grata*, Ait.)—This belongs to the Mountains, and has a flower 1 to $1\frac{1}{2}$ inch long, reddish on the tubular part, whitish at top, then changing to yellow, somewhat fragrant. The young branches are often hairy.

3. SMALL WOODBINE. (*L. parviflora*, Linn.)—Found in the Mountains, less climbing than the others, with flowers about $\frac{3}{8}$ inch long, somewhat swollen at the base of the tube, and greenish-yellow, tinged with purple.

I have heard of a yellow species in Gates County, but have never seen any specimens.

1. COMMON BAMBOO, or GREEN BRIER. (*Smilax rotundifolia*, Linn.) Very common in all the Districts, generally in thickets where the soil is rather fertile, 20 to 40 feet long, the stems and branches of a yellowish-green color, round, and armed with strong prickles, the branchlets slightly angled. The leaves are deciduous, 3 or 4 inches long, roundish and heart-shaped. The berries, as in most of the species, are bluish-black, borne in bunches upon a common stalk in the fork of the leaves, and which is about the same length with the leaf-stalk.

2. (*S. tannoides*, Linn.)—A stont prickly vine with angled branchlets, occurring in the Lower and Middle Districts. The leaves are somewhat fiddle-shaped or contracted in the middle, the base sometimes spreading into rounded projections. The general fruit-stalk is a little flattened, about $1\frac{1}{2}$ inch long, and twice the length of the leaf-stalk.

3. CHINA ROOT. (*S. Pseudo-China*, Linn.)—Stont and prickly like No. 2, 10 to 15 feet long, the branches roundish and not prickly, and the roots tuberous. The leaves are large, 4 to 7 inches long, ovate, green both sides, the edges and nerves on the under-side roughened with minute prickles. The general fruit-stalk is flat and 2 or 3 inches long. The berries are blackish and larger than in the preceding species.

4. SARSAPARILLA. (*S. glauca*, Walt.)—Not uncommon in all the Districts in cultivated grounds near streams. The stems are prickly and 2 to 4 feet long. The leaves are ovate, and covered, especially on the underside, with a white bloom that rubs off under the finger. The berries are black. The common fruit-stalk is 2 or 3 times longer than the leaf stalk. The root of this is sometimes used in the composition of diet drinks. It is not the Sarsaparilla of the Druggists, but is said to be often mixed with it.

5. (*S. Walteri*, Pursh.)—Stem dark green, angled, 10 to 15 feet long, having prickles only towards the bottom, running over bushes and up small trees in branch swamps of the Lower District. Leaves deciduous, ovate, heart-shaped, smooth, dark shining green above, paler beneath, terminating in a small, almost prickly point, 3 or 4 inches long, 2 or 3 wide, and having 3 distinct and 2 obscure nerves. The berries are scarlet and very conspicuous in Winter. This has a creeping root.

6. (*S. lanceolata*, Linn.)—This and No. 5 are the only species

with red berries. But this has evergreen leaves, narrower than in the preceding and acute at base. The branches, too, are not angled, and the root is tuberous. I have not myself met with it, and give it on the authority of others.

7. (*S. laurifolia*, Linn.)—This is a showy species, and like Nos. 6 and 8, has evergreen leaves. It runs to a great length over bushes and up lofty trees, the lower part only being prickly. The leaves are thick and shining, lance-shaped or oblong. The general fruit-stalk is equal to the leaf-stalk, 1-6 to $\frac{1}{4}$ inch long. Berries black. This seems confined to wet places in the Lower District.

8. (*S. auriculata*, Walt.)—Similar to No. 7, slightly or not at all prickly, growing over small shrubs on the coast, flowers fragrant. The leaves are perennial, 1 or 2 inches long, narrowly ovate, 3 to 5 nerved, with conspicuous cross veins, especially beneath, terminated by an abrupt almost prickly point. Common fruitstalk rather shorter than the leaf-stem. Berries black.

RATTAN. SUPPLE JACK. (*Berchemia volubilis*, DC.)—A very tough flexible vine running up trees. The leaves are alternate, 1 or 2 inches long, ovate, dark green, very smooth, not toothed, having prominent parallel unbranched straight veins running obliquely from the midrib to the margin. The berry is dark purple, about $\frac{1}{4}$ inch long, with a thin coat and a hard smooth nut. Grows from Virginia southward through our Lower District.

(*Sageretia Michauxii*, Brogn.)—Grows upon the sandy soil of the coast, 6 to 18 feet long, with thorn-like spreading branches. Leaves 1 inch long, ovate, opposite, smooth and shining, finely toothed. Flowers very small, in loose clusters. The berry is small and round, dark purple, and pleasantly acid. I have not met with this, and have introduced it here on the authority of Michaux.

(*Cocculus Carolinus*, D. C.)—This runs extensively over shrubs and small trees on the borders of damp woods and streams, from the coast to Lincoln. The leaves are 2 to 4 inches long, broadly ovate and heart-shaped, sometimes 3 lobed, smooth above, with a soft gray down underneath. The ripe berries are red, about the size of a small pea, growing in small clusters, containing a hard flat nut which is curved nearly into a ring.

MOON SEED. (*Menispermum Canadense*, Linn.)—This is 6 to 12 feet long, and woody only in the lower part. It is the only one of our woody Climbers that has the leaf-stalk inserted into the plate of the leaf instead of the lower edge. The berries are black and contain a flat nut, as in the preceding species, curved into the form of a horse shoe. Rare in the Lower District, not uncommon elsewhere.

POISON VINE. (*Rhus radicans*, Linn.)—Now considered by Botanists as only a variety of *Poison Oak*, but necessarily separated in the arrangement I have adopted. It is the only trifoliate woody Climber we have. Like *Poison Oak* and *Poison Sumach*, very poisonous to some people. Common through the State.

The next GROUP of CLIMBERS, comprising five genera, have their fruit in dry *Pods*. All of the species are ornamental.

TRUMPET FLOWER. (*Tecoma radicans*, Juss.)—This splendid Climber, ascending the loftiest trees, is found from the coast to the lower part of the Mountains, preferring damp rich soils. Its dark green compound leaves, and scarlet tubular flowers which are 2 to 3 inches long, make it an attractive ornament in yards and gardens. This harmless plant has the reputation, with some, of being poisonous.

CROSS VINE. (*Bignonia capreolata*, Linn.)—This, like the preceding, is sometimes called *Trumpet Flower*. The flowers are of similar form, about 2 inches long, but are of a duller red on the outside and yellow within. The leaves are of a dull green, growing in pairs from the end of a common foot-stalk, each leaflet also having its own stalk. This does not climb to so great a height as the other. A cross section of the stem exhibits a portion of its inner structure in the form of a Maltese cross, which gives the name to this plant. Not uncommon in the Lower and Middle Districts.

VIRGIN'S BOWER. (*Wistaria frutescens*, DC.)—This luxuriant, much admired Climber is found, I think, only in damp rich soils of the Lower District. It stands cultivation remarkably well in the Middle District. The leaves are pinnate, like those of the Locust ;

and the flowers are of the size and structure of the Garden Pea, purplish-blue, in large pendant compact clusters 4 to 6 inches long. We have no other woody Vine answering to these characters. The stem is exceedingly tough and serves well for withes or ligatures.

CAROLINA JESSAMINE. (*Gelsemium sempervirens*, Ait.)—No plant is more common in the Lower District, but it reaches very little into the Middle. It extends northward into Virginia, but becomes much more luxuriant as we go south. Its graceful evergreen leaves, the profusion of its large bright yellow and deliciously fragrant blossoms, render this vine the pride of our forest. The odor of the flowers in a close room sometimes induces headache. Most of the plant, especially the root, taken internally, is narcotic and poisonous. A tincture of the root, *judiciously administered*, is useful in rheumatic affections; but in the hands of quacks death has been caused by it.

(*Forsteronia difformis*, A. DC.)—A smooth twining plant, 6 to 12 feet long, found chiefly in the Lower District, but extending into the interior as far at least as Wake County. It is sometimes mistaken for the *Yellow Jessamine*, but the flowers are tubular and smaller, more like those of a Woodbine, about 1-3 inch long, and greenish-yellow. The fruit is a slender pod, containing seeds that have a tuft of down.

The next GROUP of three genera have their seeds in small dry capsules.

WAX-WORK. BITTERSWEET. (*Celastrus scandens*, Linn.)—This is to me the rarest plant in the State, as I have seen but a single stock, near Lincolnton. This is its most Southern known limit. It ascends trees to the height of 12 or 15 feet. The leaves are about 3 inches long, taper pointed, smooth, toothed. The berry-like capsule is orange-red, clustered on the ends of its short branches, of the size of a large Pea, bursting when mature and disclosing 3 to 6 scarlet seeds. In this state it is quite an ornamental vine.

(*Decumaria barbara*, Linn.)—A pretty vine ascending trunks by means of rootlets insinuated into the bark, after the manner of the *Poison Vine*. The leaves are 3 or 4 inches long, broadly ovate,

opposite, rather thick and shining, generally with scattered teeth towards the upper end. The flowers are small, white and fragrant, in showy compound clusters on the ends of the branches, opening in May. This is found in the Lower District only, and is unknown North of this State.

WILD GINGER. BIG SARSAPARILLA. (*Aristolochia Siphon*, L'Her.) Found in rich soils all along our Mountain rivulets, climbing over bushes, and sometimes ascending trees. The stems are occasionally 2 inches thick. The leaves are roundish heart-shaped, 8 to 12 inches broad, and slightly downy on the underside. The flower is coarse, brownish-purple, $1\frac{1}{2}$ inch long, somewhat tubular, with the top cut into three segments, below which it is contracted and curved like a Dutch pipe, from which, in some parts of the United States, it has gotten the name of *Dutchman's Pipe*. The root is very aromatic and stimulant, like Ginger, and would serve as a medicine where these properties are indicated.

The two remaining genera have *naked seeds*, which are remarkable for their long feathered tails.

VIRGIN'S BOWER. (*Clematis Virginiana*, Linn.)—A partly woody vine, 10 or 15 feet long, climbing over thickets and fences. It is found from the coast to the Mountains, generally near streams, but is less common in the Lower District. The leaves are composed of 3 ovate leaflets which are a little cut. The flowers are in loose clusters, $\frac{1}{2}$ to $\frac{3}{4}$ inch broad, and clothing the upper part of the vine with a flowing mantle of white. The flowers are succeeded by heads of feathered seeds which are still more ornamental than the blossoms.

(*Atragene Americana*, Sims.)—This is accredited by others to the Mountains of North-Carolina, but it has escaped my own observation. It is a very showy vine, both in fruit and flower, and like the preceding, is woody only in its lower parts. It climbs over rocks and bushes by means of its leaf-stalks. The leaves are in pairs on opposite sides of the stem, making 4 in a circle, each long leaf-stalk bearing 3 leaflets. The flowers are bluish purple, 2 or 3 inches broad, followed by heads of seeds which have long feathered tails.

A TABULAR VIEW OF THE SPECIES, ARRANGED ACCORDING TO THE CHARACTER OF THEIR FRUIT.

[N. B. Plants without a popular name are enclosed in parentheses, and will be found also in the Index.]

I.—TREES.

FLESHY FRUIT.

Stone Fruit.

Plums,
Cherries,
Mock Orange,
Devil Wood.

Pulpy Fruit.

Apples,
Persimmon.

BERRIES.

Red.

Holly,
Service Tree,
Dogwood,
Mountain Ash,
Magnolias,
Yellow Wood,
Hackberry.

Black or Blue.

Mulberry,
Palmetto,
Buckthorn,
Black Gum,
Cedar,
Sassafras,
Red Bay.

Whitish.

China Tree.

DRY FRUIT.

Nuts.

Oaks,
Hickories,
Walnuts,
Chesnut,
Chinquapin,
Beech,
Buckeye.

Cones.

Pines,
Firs,
Spruces,
White Cedar,
or
Juniper,
Cypress.

Pods.

Locust,
Honey Locust,
Catalpa,
Coffee Tree,
Red Bud.

Tassels.

Willows,
Poplars, or
Cottonwoods,
Birches,
Hornbeam,
Iron Wood.

Bur.

Sweet Gum.

Nutlets.

Sycamore,
Planer Tree.

Flat and winged.

Maples,
Ash-leaved Maple,
Ashes,
Elms.

Capsules.

<i>Large.</i>	<i>Small.</i>
Tulip Tree, or	Linn Tree,
Poplar,	Sorrel Tree.
Loblolly Bay.	

Winged Nuts.

Snow Drop Tree.

II.—SHRUBS.

FLESHY FRUIT.

Stone Fruit.

Plums,
Fringe Tree,
Oil Nut.

Red.

Red Haws,
Barberry,
Bermuda Mulberry,
Huckleberry,
Creep. Huckleberry,
Bearberry,
Cranberry,
Elder,
Coral Berry,
Chokeberry,
Yopon,
Dahoon Holly,
Sumach,
Poison Oak,
Flowering Ras'b'ry,
Mountain Tea,
Spice Bush,
Pond Bush,
Leather Wood,
(Rex.)

Black or Blue.

Black Haws,
Gallberries,
Dogwoods,
Privet,
Carolina Buckthorn,
Prickly Ash,
Elder,
Dwarf Palmetto,
Gooseberries,
Currants,
Huckleberries,
Sparkleberry,
Blackberries,
Dewberry,
Raspberry.

*Berries.**Whitish.*

Mistletoe,
Deerberry,
Dogwoods.

Large Fleshy.

Papaws,
Spanish Bayonet,
Bear Grass,
Roses.

DRY FRUIT.

Nuts.

Hazel,
Buckeye.

Nutlets.

Witch Hazel,
Button Bush,
Dwarf Alder,
Wax Myrtle,
Sweet Fern.

Tassels and Cones.

Willows,
Alder,
Arbor Vitæ.

Bladdery.

Bladder Nut,
Sweet Shrub.

Flat and winged.

Maples,
Hop Tree.

Naked Seeds.

Marsh Elder,
Groundsel.

Grass-like.

Reed or Cane.

DRY CAPSULES.

Laurel,	He Huckleberry,	Toothache Tree,
Ivy,	False Heath,	Indigo Bush,
Wicky,	Syringa,	Mock Orange,
Honeysuckles,	Hydrangea,	(Stuartia,)
Dog Laurel,	Hardhack,	(Stillingia,)
Fetter Bush,	Queen of the Meadow,	(Darbya,)
Pepper Bush.	Bush Honeysuckle,	(Buckleya,)
Stagger Bush,	Strawberry Bush,	Red Root,
(Andromeda,)	Burning Bush,	Yellow Root,
(Cassandra,)	Trailing Arbutus,	Rock Rose,
(Leucothœ,)	(Hudsonia,)	(Aseyrum,)
Sweet Pepper Bush,	Swamp Loosestrife.	Flowering Moss.
(Itea,)		
Sand Myrtle.		

III.—VINES.

<i>Reddish.</i>	<i>Berries.</i>	<i>Pods.</i>	<i>Capsules.</i>
Grapes,	<i>Blackish.</i> Grapes,	Trumpet Flower,	Bittersweet,
Woodbine,	China Root,	Cross Vine,	Wild Ginger,
Bamboo,	Bamboo,	Jessamine,	(Decumaria.)
Poison Vine,	Sarsaparilla,	Virgin's Bower,	
(Cocculus.)	Virginia Creeper,	(Forsteronia,)	
	Rattan,		
	Moonseed,		
	(Sageretia,)		
	(Berchemia.)		

Naked and Feathered Seeds.

Virgin's Bower,
(Atrogene.)

ERRATA.

- Page 42, line 14 from top, for Hickorys, read Hickory.
" 43, " 18 " bottom, for oliveformis, read olivæformis.
" 58, " 14 " " for dried, read dyed.
" 110, the 1st and 2d paragraphs should be transposed.
" 111, line 2 from top, for eight, read nine.

GEOLOGICAL AND NATURAL HISTORY SURVEY

OF

NORTH CAROLINA.

PART III,

BOTANY;

CONTAINING A CATALOGUE OF THE INDIGENOUS AND
NATURALIZED PLANTS OF THE STATE,

BY

REV. M. A. CURTIS, D. D., F. A. A. S., &c., &c.

RALEIGH:

PRINTED AT N. C. INSTITUTION FOR THE DEAF AND DUMB AND THE BLIND.

1867.

NORTH CAROLINA

PART III.

BOTANY.

CONTAINING A LIST OF THE PLANTS OF THE STATE, WITH
A DESCRIPTION OF THE SEVERAL SPECIES.

BY

JOHN W. WILSON.

To His Excellency, JONATHAN WORTH,
Governor of North Carolina:

SIR:—The following Catalogue of the Plants of North Carolina is alluded to in the letter of Prof. Emmons to Gov. Ellis, printed in the introductory portion of my Report on the Woody Plants of the State, which this was intended to accompany. The printing of it at that time was, however, prevented by more important matters of national interest that were then occupying the public mind. It gives me pleasure now to submit the Report to your consideration, not only because I desire to secure a permanent record of observations and discoveries made through a period of about twenty-five years, but on account of the interest it should have among Scientists as determining the localities and range of our vegetation, and as being much the most extensive local list of Plants ever published in North America.

The extent of this list is not due to the greater amount of our vegetation, though there are very few States that contain a greater number or richer variety of species, but to the fact that more attention has been given in this State than elsewhere to the investigation of the lower Orders, or Flowerless Plants, and especially of the Fungi. The accomplished Dr. Schweinitz, while a resident at Salem, paid great attention to these obscure forms, and was the pioneer of Cryptogamic Botany in America. It will be seen, in the frequent reference to his name in my list of these Plants, how much we are indebted to him for a knowledge of these species, many of which have not been detected by others.

But large as is the following list, comprising over forty-eight hundred species, it is not offered as a complete enumeration of all the plants growing in the State. It is only a record of what have been thus far discovered. Of our Flowering Plants probably very few have escaped notice; but of the Flowerless kinds doubtless many more remain to reward the researches of future observers. We may confidently assume that the actual number of Plants indigenous to North Carolina exceeds five thousand species.

Hoping this contribution to a knowledge of the Natural History of our State will prove acceptable to yourself and the public generally, I remain

Yours, very respectfully,

M. A. CURTIS.

PRELIMINARY

PREFACE.

THE scientific names in this Catalogue, to the end of the list of Ferns, are in accordance with the nomenclature of Dr. Chapman's FLORA OF THE SOUTHERN UNITED STATES.

Of the Flowering Plants 147 are naturalized species. These are indicated in the Catalogue by *Italics*.

Among the Fungi, the species in *Italics*, (over 100 in number), are eatable Mushrooms.

The division of the State into Botanical Districts, as explained in the Introduction to the WOODY PLANTS OF NORTH CAROLINA, is here indicated by the abbreviations Low, Mid, and Up. Where a species is found in all the Districts, the word *Common* is used.

The name of a person put in brackets after any of the above abbreviations, as (Schw.) for Schweinitz, (Rav.) for Ravenel, &c., indicates that the plant is inserted on his authority for the locality.

Special acknowledgments are due to W. S. Sullivant, of Ohio, for his arrangement of my lists of MUSCI and HEPATICAE, and for valuable additions to them. Also, to Prof. Tuckerman, of Amherst College, for like important service in the list of LICHENS. Without the aid of these skillful Botanists the catalogue of these Orders would have been far less accurate and complete.

PRINTING PLANT

PRINTING PLANT

PRINTING PLANT

PRINTING PLANT

FLOWERING PLANTS.

CLASS I. EXOGENOUS PLANTS.

RANUNCULACEÆ.

ATRAGENE Americana, Sims.—In the Upper District.

CLEMATIS ochroleuca, Ait. (Dwarf Clematis.)—Mid. and Up. Dist.
— ovata, Pursh.—Up. Dist.

Viorna, Linn. (Leather Flower.)—Mid. and Up. Dist.

crispa, Linn. (Blue Jessamine.)—Low. Dist.

Virginiana, L. (Virgin's Bower.)—Mid. and Up. Dist.;
rare in the Lower.

ANEMONE nemorosa, L. (Wood Anemone.)—Up. Dist. (*Silas McDowell, Esq.*)

Caroliniana, Walt. (Carolina Anemone.)—Up. Dist.
(*Schweinitz.*)

Virginiana, L. (Virginia Anemone.)—Common in all
the Districts.

HEPATICA triloba, Chaix. (Liver Leaf.)—Rocky Hills of Mid. Dist.

THALICTRUM dioicum, L. (Early Meadow Rue.)—In the Mountains.

Cornuti, L. (Meadow Rue.)—In all the Districts.

clavatum, D. C. (Slender Meadow Rue.)—Sources of
all the mountain streams.

nudicaule, Schwein.—On the Yadkin River.

(*Schweinitz.*)

anemonoides, Michx. (Rue Anemone.)—Lower and
Mid. Dist.

TRAUTVETTERIA palmata, F. & M.—Along mountain streams.

RANUNCULUS aquatilis, L. (White Water-Crowfoot.)—Upper Dist.

parviflorus, L. (Small flowered Crowfoot.)—Low. and
Mid. Dist.

alisinæfolius, Geyer. (Spearwort.) Up. Dist.

pusillus, Poir. (Dwarf Crowfoot.)—Low. and Mid.
Dist.

- RANUNCULUS abortivus**, L. (Smooth Crowfoot.)—Low. and Mid. Dist.
recurvatus, Poir. (Rough Crowfoot.)—Low. and Mid. Dist.
secleratus, L. (Biting Crowfoot.)—Low. Dist.
Pennsylvanicus, L. (Bristly Crowfoot.)—Mid. Dist.
Purshii, Richm. (Yellow Water Crowfoot.)—Middle Dist., in shallow water.
repens, L. (Creeping Crowfoot.)—In all the Districts.
 “ *var. hispidus*.—Mid. Dist.
 “ *var. nitidus*.—Low. Dist.
palmatus, Ell.—Low. Dist.
bulbosus, L. (Buttercups.)—Low. Dist.
- AQUILEGIA Canadensis**, L. (Columbine.)—Hills of Mid. and Up. Dist.; rare in the Lower.
- DELPHINIUM azureum**, Michx. (Blue Larkspur.)—Up. Dist.
tricorne, Michx. (Dwarf Larkspur.)—Mountains.
 (*Michaux.*) Halifax. (*T. B. Hill.*)
exaltatum, Ait. (Tall Larkspur.)—Mountains.
 (*Michaux.*)
Consolida, L. (Garden Larkspur.)—Mid. Dist.
- ACONTIUM uncinatum**, L. (Monk's Hood. Wolf's Bane.)—Mid. and Up. Dist.
reclinatum, Gray. (Trailing Monk's Hood.)—On the mountains of Ashe and Yancey.
- ZANTHORRIZA apiifolia**, L'Her. (Yellow Root.)—Hills in the Mid. and Up. Dist.
- HYDRASTIS Canadensis**, L. (Orange Root, Yellow Puccoon.)—Mountains.
- ACTŒA alba**, Bigel. (Baneberry.)—Mountains.
- CIMICIFUGA racemosa**, Ell. (Rattle Top.)—Mid. and Up. Dist.
cordifolia, Pursh. (Heart-leaved Rattle Top.)—Mountains. (*Prof. Gray.*)
Americana, Michx. (Mountain Rattle Top.)—Mountains.

MAGNOLIACEÆ.

- MAGNOLIA grandiflora**, L. (Magnolia.)—Brunswick Co.
glauca, L. (Sweet Bay.)—Low. and Mid. Dist.
 Umbrella, Lam. (Umbrella Tree.)—In all the Districts.
acuminata, L. (Cucumber Tree.)—Mountains.

MAGNOLIA cordata, Michx. (Heart-leaved Cucumber Tree.)—Mountains.

Fraseri, Walt. (Long-leaved Cucumber Tree.)—Mountains.

macrophylla, Michx. (Large-leaved Umbrella Tree.)—Lincoln Co.

LIRIODENDRON Tulipifera, L. (Tulip Tree. Poplar.)—In all the Districts.

ANONACEÆ.

ASIMINA triloba, Dunal. (Papaw.)—Mid. Dist.

parviflora, Dunal. (Dwarf Papaw.)—All the Districts.

MENISPERMACEÆ.

MENISPERMUM Canadense, L. (Moonseed.)—Low., Mid. and Up. Dist.

COCCULUS Carolinus, D. C. (Red-berried Moonseed.)—Low. and Mid. Dist.

BERBERIDACEÆ.

BERBERIS Canadensis, Pursh. (Barberry.)—From Lincoln to Macon County.

CAULOPHYLLUM thalictroides, Michx. (Pappoose Root.)—Mountains.

DIPHYLLEIA cymosa, Michx. (Umbrella Leaf.)—Mountains.

PODOPHYLLUM peltatum, L. (May Apple.)—All the Districts.

NELUMBIACEÆ.

NELUMBIUM luteum, Willd. (Water Chinquapin. Duck Acorn.)—Lower District.

CABOMBACEÆ.

CABOMBA Caroliniāna, Gray.—Lower District.

BRASENIA peltata, Pursh. (Water Shield.)—Lower District.

NYMPHÆACEÆ.

NYMPHÆA odorata, Ait. (Pond Lily. Bonnets.)—Lower Dist.

NUPHAR advena, Ait. (Yellow Water Lily.)—Low., Mid. and Up. Dist.

sagittæfolia, Pursh.—Lower Dist.

SARRACENIACEÆ.

SARRACENIA purpurea, L. (Pitcher Plant.)—Low. and Mid. Dist.

rubra, Walt. (Red-flowered Trumpet Leaf.)—Henderson Co.

SARRACENIA flava, L. (Trumpets. Watches.)—Low. and Mid. Dist.
variolaris, Michx. (Spotted Trumpet Leaf.)—South-
 eastern part of the State.

PAPAVERACEÆ.

ARGEMONE Mexicana, L. (Mexican Poppy.)—Low. Dist.
SANGUINARIA Canadensis, L. (Blood Root. Puccoon.)—Common
 through the State.
PAPAVER dubium, (Com. Poppy.)—Cultivated fields in Low. Dist.

FUMARIACEÆ.

ADLUMIA cirrhosa, Raf.—On the French Broad River.
DICENTRA Cucullaria, D. C. (Dutchman's Breeches.)—Mountains.
eximia, D. C. (Bleeding Heart.) French Broad River.
 (*Buckley*.)
CORYDALIS aurea, Willd.—Low. Dist.
glauca, Pursh.—Mountains.

CRUCIFERÆ.

NASTURTIUM tanacetifolium, Hook. & Arn.—Low. Dist.
palustre, D. C. (Marsh Cress.)—Low. Dist.
lacustre, Gray. (Lake Cress.)—Mid. Dist.
officinale, R. Br. (Water Cress).—throughout the
 State.
CARDAMINE rhomboidea, D. C. (Spring Cress.)—Low. Dist.
rotundifolia, D. C. (Round-leaved Cress.)—Mountains.
spatulata, Michx.—Mountains. (*Michaux*.)
hirsuta, L. (Bitter Cress.)—Low. Dist.
Ludoviciana, Hook.—Mid. Dist.? (*Prof. Mitchell*.)
DENTARIA diphylla, Michx. (Pepper Root.)—Mountains.
laciniata, Muhl.—Mid. and Up. Dist.
heterophylla, Nutt.—Mountains. (*Buckley*.)
multifida, Muhl.—Mid. Dist.? (*Schweinitz*.)
ARABIS lyrata, L. (Rock Cress.)—Phœnix Mt. (*Prof. Gray*.)
Canadensis, L. (Sickle Pod.)—Mid. and Up. Dist.
lævigata, D. C.—Mid. and Up. Dist.
BARBAREA præcox, R. Br. (Bermuda Cress, Scurvy Grass.) Or-
 ange Co.
SISYMBRIUM Thaliana, Gaud. (Mouse-ear Cress.) Lower and Mid.
 Dist.

SISYMBRIUM canescens, Nutt. (Tansy Mustard.)—Lower and Mid. Dist.

officinale, Scop. (Hedge Mustard.)—Do.

DRABA Caroliniana, Walt.—Low. and Mid. Dist.

ramosissima, Desv.—Buncombe Co. (*Buckley*.)

verna, L. (Whitlow Grass.)—Low. and Mid. Dist.

CAMELINA sativa, Crantz. (False Flax.)—N. Hanover, in cultivated fields. (*Dr. McRee*.)

SENEBIERA pinnatifida, D. C. (Wart Cress, Swine Cress.)—Low. and Mid. Dist.

LEPIDIUM Virginicum, L. (Wild Peppergrass.)—Do.

CAPSELLA Bursa-pastoris, Moench. (Shepherd's Purse.)—Common.

CAKILE maritima, Scop. (Sea Kale.)—On the Sea beach.

CAPPARIDACEÆ.

GYNANDROPSIS pentaphylla, D. C.—Waste grounds near Wilmington. (*Dr. McRee*.)

VIOLACEÆ.

VIOLA cucullata, Ait. (Blue Violet.)—Common.

palmata, L. (Hand-leaf Violet)—Do.

villosa, Walt. (Hairy Violet.)—Low. and Mid. Dist.

sagittata, Ait. (Arrow-leaf Violet.)—Mid. Dist.

pedata, L. (Bird-foot Violet.)—Low. and Mid. Dist.

primulaefolia, L. (Primrose-leaved Violet.)—Do.

lanceolata, L. (Lance-leaved Violet.)—Do.

blanda, Willd. (Sweet White Violet.)—Mid. Dist.

rotundifolia, Michx. (Round-leaf Violet.)—Mountains.

striata, Ait. (Pale Violet.)—Mid. Dist.

Canadensis, L. (Canada Violet.)—Mountains.

hastata, Michx. (Spear-leaved Violet.)—Do.

pubescens, Ait. (Yellow Violet.)—Mid. and Up. Dist.

tricolor, L. var. *arvensis*, D. C. (Wild Pansy.)—All the Districts. Not very common.

SOLEA concolor, Ging. (Green Violet.)—Mid. and Up. Dist. Rare.

CISTACEÆ.

HELIANTHEMUM Carolinianum, Michx. (Rock Rose.)—Low and Mid Dist.

corymbosum, Michx.—Low. Dist.

Canadense, Michx. (Frost-weed.)—Low. Dist.

LECHEA major, Michx. (Pin-weed.)—Low. and Mid. Dist.
minor, Lam.—Do.

HUDSONIA montana, Nutt.—Table Rock, Burke Co.

DROSERACEÆ.

DROSERA filiformis, Raf. (Thread-leaved Sundew.)—Low. Dist.
longifolia, L. (Long-leaved Sundew.)—Do.

rotundifolia, L. (Round-leaved Sundew.)—All the Districts.

brevifolia, Pursh. (Short-leaved Sundew.)—Low. and Mid. Dist.

DIONÆA muscipula, Ellis. (Fly Trap.)—Low. Dist.

PARNASSIACEÆ.

PARNASSIA Caroliniana, Michx. (Grass of Parnassus.)—In all the Districts.

asarifolia, Vent.—Yancey to Haywood.

HYPERICACEÆ.

HYPERICUM prolificum, L. (Rock Rose.)—In all the Districts, especially in the Upper.

Buckleyi, M. A. C.—Mountains south of French Broad River.

perforatum, L. (St. John's Wort.)—Mid. Dist.

maculatum, Walt.—Low. and Mid. Dist.

corymbosum, Muhl.—All the Districts.

fasciculatum, Lam.—Low. and Mid. Dist.

galioides, Lam.—Low. Dist.

nudiflorum, Michx.—Low. and Mid. Dist.

graveolens, Buckl.—Southern Mountains.

pilosum, Walt.—Low. and Mid. Dist.

angulosum, Michx.—Mid. Dist.

mutilum, L.—Low. and Mid. Dist.

Canadense, L.—All the Districts.

Sarothra, Michx. (Ground Pine.)—Coast to Cherokee.

ASCYRUM Crux-Andreæ, L. (St. Peter's Wort.)—Common.

stans, Michx.—Common.

ELODEA Virginica, Nutt. (Marsh John's Wort.)—Low. Dist.

petiolata, Pursh.—All the Districts.

PORTULACACEÆ.

PORTULACA oleracea, L. (Purslane.)—Common in cultivated grounds.

TALINUM teretifolium, Pursh.—Rocky hills of Mid. and Up. Dist.

CLAYTONIA Virginica, L. (Spring Beauty).—Low. and Mid. Dist.

Caroliniana, Michx.—Mountains.

SESUVIUM pentandrum, Ell. (Sea Purslane).—Saline marshes.

portulacastrum, L.—Do.

CARYOPHYLLACEÆ.

PARONYCHIA dichotoma, Nutt.—Mountains.

argyrocoma, Nutt.—Do.

herniariodes, Nutt.—Low. Dist.

ANYCHIA dichotoma, Michx.—All the Districts.

STIPULICIDA setacea, Michx.—Low. Dist.

SPERGULARIA rubra, Pers. (Sand Spurrey).—Sea-coast.

SPERGULA arvensis, L. (Pine Cheat. Corn Spurrey).—Fields in Up. Dist.

MOLLUGO verticillata, L. (Indian Chickweed).—Common in cultivated grounds.

SAGINA Elliottii, Fenzl.—Low. and Mid. Dist.

ALSINE squarrosa, Fenzl. (Barrens Sandwort).—Low. Dist.

glabra, Gray.—On rocky mountains.

Michauxii, Fenzl.—Mid. and Up. Dist.

ARENARIA diffusa, Ell.—Low. Dist.

serpyllifolia, L. (Sandwort).—Low. and Mid. Dist.

STELLARIA pubera, Michx. (Star Chickweed).—Mid. and Up. Dist.

media, Smith. (Chickweed).—Common in cultivated lands.

uniflora, Walt.—Low. Dist.

CERASTIUM vulgatum, L. (Mouse-ear Chickweed).—Common.

viscosum, L.—Common.

arvense, L.—Mid. and Up. Dist.

nutans, Raf.—Up. Dist.

SILENE stellata, Ait. (Star Campion. Thermon Snake-root).—Up. Dist.

ovata, Pursh.—Mountains.

Virginica, L. (Indian Pink).—Common.

Pennsylvanica, Michx.—Low. and Mid. Dist.

Antirrhina, L. (Catchfly).—Common.

SAPONARIA officinalis, L. (Soapwort. Bouncing Bet.).—Waste grounds.

AGROSTEMMA *Githago*, L. (Cockle.)—In fields of Grain.

MALVACEÆ.

MALVA *rotundifolia*, L. (Mallow.)—Common in waste grounds.

CALLIRRHÆ *triangulata*, Gray.—Lincoln Co. (*Dr. Hunter*.)

SIDA *spinosa*, L.—Common about settlements.

rhombifolia, L.—Burke Co. Also near Newbern. (*Croom*.)

Elliottii, Tor. & Gr.—Low. Dist.

ABUTILON *Avicennæ*, Gært. (Velvet Leaf.)—Rather common.

MODIOLA *multifida*, Moench.—Low. Dist. Rare.

KOSTELETZKYA *Virginica*, Presl.—Low. Dist.

HIBISCUS *aculeatus*, Walt.—Do.

Moscheutos, L. (Swamp Mallow.)—Throughout the State.

militaris, Cav. (Rose Mallow.)—Low. Dist.

TILIACEÆ.

TILIA *Americana*, L. (Linn or Lime Tree.)—Mid. and Up. Dist.

pubescens, Ait. (Southern Linn.)—Low. Dist.

heterophylla, Vent. (White Linn.)—All the Districts.

CORCHORUS *siliquosus*, L.—Bath. Apparently introduced.

CAMELLIACEÆ.

GORDONIA *Lasianthus*, L. (Loblolly Bay. Black Laurel.)—Low. Dist.

STUARTIA *Virginica*, Cav.—Low. Dist.

pentagyna, L'Her.—Mid. and Up. Dist.

MELIACEÆ.

MELIA *Azedarach*, L. (China Tree.)—A common shade tree in the Low. Dist.

LINACEÆ.

LINUM *Virginianum*, L. (Wild Flax.)—Common.

Boottii, Planch.—Pine woods of Low. and Mid. Dist.

OXALIDACEÆ.

OXALIS *stricta*, L. (Yellow Wood-Sorrell.)—Common.

Acetosella, L. (White Wood-Sorrell.)—Mountains.

violacea, L. (Purple Wood-Sorrell.)—Mid. and Up. Dist.

ZYGOPHYLLACEÆ.

TRIBULUS *cistoides*, L.—Waste ground near Wilmington.—(*Dr. McRee*.)

GERANIACEÆ.

GERANIUM *maculatum*, L. (Cranesbill.)—Mid. and Up. Dist.

Carolinianum, L.—Common.

BALSAMINACEÆ.

- IMPATIENS pallida*, Nutt. (Touch me not.)—Mountains.
fulva, Nutt. (Jewell Weed.)—Low. and Mid. Dist.

RUTACEÆ.

- ZANTHOXYLUM Carolinianum*, Lam. (Prickly Ash, Toothache Tree.)
 Low. Dist.
PTELEA trifoliata, L. (Hop Tree. Wafer Ash.)—Low. and Mid.
 Dist.
mollis, M. A. C.—Low. Dist.

ANACARDIACEÆ.

- RHUS typhina*, L. (Staghorn Sumach.)—Up. Dist.
glabra, L. (Smooth Sumach.)—Mid. and Up. Dist.
copallina, L. (Common Sumach.)—Common.
pumila, Michx. (Dwarf Sumach.)—Low. and Mid. Dist.
venenata, D. C. (Poison Sumach.)—All the Districts.
Toxicodendron, L. (Poison Oak.)—Do.
radicans, L. (Poison Vine.)—Do.

VITACEÆ.

- VITIS Labrusca*, L. (Fox Grape.)—Low. and Mid. Dist.
aestivalis, Michx. (Summer Grape.)—Common.
vulpina, L. (Muscadine.)—Do.
cordifolia, Michx. (Frost Grape.)—Mid. and Low. Dist.
bipinnata, Tor. & Gr.—Do.
AMPELOPSIS quinquefolia, Michx. (Virginia Creeper.)—Common.

RHAMNACEÆ.

- FRANGULA Caroliniana*, Gray.—All the Districts.
BERCHEMIA volubilis, D. C. (Rattan. Supple Jack.)—Low. Dist.
SAGERETIA Michauxii, Brongn.—Sea-coast.
CEANOTHUS Americanus, L. (Red Root. Jersey Tea.)—Common.

CELASTRACEÆ.

- CELASTRUS scandens*, L. (Wax-work. Bitter-sweet.)—Lincoln Co.
EUONYMUS Americanus, L. (Strawberry Bush. Bursting Heart.
 Fishwood.)—Common.
atropurpureus, Jacq. (Burning Bush.)—(*Prof. Mitchell.*)

STAPHYLEACEÆ.

- STAPHYLEA trifolia*, L. (Bladder Nut.)—Mid. Dist.

SAPINDACEÆ.

- AESCULUS Pavia*, L. (Red Buckeye.)—Low. and Mid. Dist.
flava, Ait. (Yellow Buckeye.)—Mid. and Up. Dist.

ACERACEÆ.

- ACER rubrum*, L. (Red Maple.)—Common.
dasycarpum, Ehrh. (Silver Maple.)—Mountains.
saccharinum, Wang. (Sugar Maple.)—All the Districts.
spicatum, Lam. (Mountain Maple.)—Mountains,
Pennsylvanicum, L. (Striped Maple.)—Mountains.
NEGUNDO aceroides, Mœnch. (Ash-leaved Maple.)—All the Districts,
 chiefly in the Middle.

POLYGALACEÆ.

- POLYGALA cymosa*, Walt.—Low. Dist.
ramosa, Ell.—Do.
lutea, L. (Bachelor's Button.)—Low. and Mid. Dist.
sanguinea, L.—Mid. and Up. Dist.
fastigiata, Nutt.—Low. Dist.
Nuttallii, Carey.—Low. and Mid. Dist.
incarnata, L.—Common.
setacea, Michx.—Low. Dist.
cruciata, L.—Common.
brevifolia, Nutt.—Low. Dist.
grandiflora, Walt.—Do.
polygama, Walt.—Do.
Senega, L. (Seneca Snake-Root.)—Mid. Dist.
verticillata, L.—Low. and Mid. Dist.
paucifolia, L.—Mountains.

LEGUMINOSÆ.

- CROTALARIA sagittalis*, L. (Rattle box.)—Common.
ovalis, Pursh.—Low. and Mid. Dist.
Purshii, D. C.—Low. Dist.
LUPINUS perennis, L. (Lupine.)—Low. and Mid. Dist.
villosus, Willd.—Low. Dist.
diffusus, Nutt.—Do.
TRIFOLIUM pratense, L. (Red Clover.)—Common.
repens, L. (White Clover.)—Do.
Carolinianum, Michx. (Carolina Clover.)—Low. Dist.
reflexum, L. (Buffalo Clover.)—Low. and Mid. Dist.

- TRIFOLIUM** *arvense*, L. (Rabbit-foot Clover.)—Common in old fields.
procumbens, L. (Yellow Clover.)—Low. and Mid. Dist.
- MEDICAGO** *lupulina*, L. (Hop Medick.)—Common in grass plats.
- MELILOTUS** *officinalis*, Willd. (Yellow Melilot.)—Occasionally naturalized about settlements.
alba, Lam. (White Melilot.)—Do.
- HOSACKIA** *Purshiana*, Benth.—Mecklenburg Co.
- PSORALEA** *melieotoides*, Michx.—Low. and Mid. Dist.
canescens, Michx. (Buck Root.)—Low. Dist.
Lupinellus, Michx.—Do.
- PETALOSTEMON** *corymbosum*, Michx.—Do.
- AMORPHIA** *fruticosa*, L. (Indigo Bush.)—Common.
herbacea, Walt.—Low. Dist.
- ROBINIA** *Pseudacacia*, L. (Locust.)—Mountains and upper part of Mid. Dist.
viscosa, Vent. (Clammy Locust.)—Mountains south of the French Broad.
hispida, L. (Rose Locust.)—Hills of Mid. and Up. Dist.
“ *var. nana*, Ell.—Pine Barrens of Low. Dist.
- WISTARIA** *frutescens*, D. C. (Virgin’s Bower.)—Low. Dist.
- TEPHROSIA** *Virginiana*, Pers. (Rabbit Pea.)—Common.
spicata, Tor. & Gr.—Low. and Mid. Dist.
hispidula, Pursh.—Common.
ambigua, M. A. C.—Low. Dist.
- INDIGOFERA** *Caroliniana*, Walt. (Carolina Indigo.)—Low. Dist.
- ASTRAGALUS** *Canadensis*, L.—Lincoln to Cherokee.
glaber, Michx.—Low. Dist.
obcordatus, Ell.—Low. Dist. (*Mr. Croom.*)
- VICIA** *sativa*, L. (Vetch.)—Low. Dist.
hirsuta, Koch.—Low. and Mid. Dist.
Caroliniana, Walt.—Mountains.
tetrasperma, Loisel.—Low. Dist.
- LATHYRUS** *venosus*, Muhl.—French Broad River. (*Buckley.*)
myrtifolius, Muhl.—Low. Dist.
- AESCHYNOMENE** *hispida*, Willd.—Low. Dist.
- ZORNIA** *tetraphylla*, Michx.—Do.
- STYLOSANTHES** *elatior*, Swartz. (Pencil Flower.)—Common.
- LESPEDeza** *repens*, Tor. & Gr.—Common.
violacea, Pers.—Do.

- LESPÉDEZA** violacea, var. sessiliflora.—Do.
 Stuevei, Nutt.—Low. Dist.
 hirta, Ell.—Common.
 capitata, Michx.—Do.
- DESMIDIUM** acuminatum, D. C. (Beggar Ticks.)—Up. Dist.
 nudiflorum, D. C.—Common.
 canescens, D. C.—Mid. and Up. Dist.
 cuspidatum, Tor. & Gr.—Low. Dist.
 viridiflorum, Beck.—Common.
 rotundifolium, D. C.—Do.
 ochroleucum, M. A. C.—Low. Dist.
 Canadense, D. C.—Mid. and Up. Dist.
 Dillenii, Darl.—Low. Dist.
 glabellum, D. C.—Low. and Mid. Dist.
 levigatum, D. C.—Do.
 paniculatum, D. C.—Common.
 tenuifolium, Tor. & Gr.—Low. and Mid. Dist.
 strictum, D. C.—Low. Dist.
 Marilandicum, Boott.—Common.
 ciliare, D. C.—Common.
 rigidum, D. C.—Do.
 lineatum, D. C.—Low. Dist.
- RHYNCHOSIA** tomentosa, Tor. & Gr.—Low. and Mid. Dist.
 “ var. monophylla, T. & G.—Low. Dist.
 “ var. erecta, T. & G.—Low. and Mid. Dist.
 “ var. volubilis, T. & Gr.—Low. Dist.
- APLOS** tuberosa, Mench. (Ground Nut.)—Common.
- PHASEOLUS** perennis, Walt. (Wild Bean.)—Do.
 diversifolius, Pers.—Low. Dist.
 helvolus, L.—Sea-coast to the Mountains.
- ERYTHRINA** herbacea, L.—Low. Dist.
- CLITORIA** Mariana, L.—Coast to Cherokee.
- CENTROSEMA** Virginiana, Benth.—Do.
- AMPHICARPEA** monoica, Nutt. (Pea Vine.)—Common, especially in the mountains.
- GALACTIA** pilosa, Ell. (Milk Pea.)—Low. and Mid. Dist.
 mollis, Michx.—Do.
 glabella, Michx.—Do.
 sessiliflora, Tor. & Gr.—Cumberland Co.
- BAPTISIA** lanceolata, Ell.—Low. Dist.

- BAPTISA villosa, Ell.—Do.
 tinctoria, R. Br. (Wild Indigo.)—Common.
 alba, R. Br.—Common.
- THERMOPSIS Caroliniana, M. A. C.—Haywood to Cherokee.
 fraxinifolia, M. A. C.—Table Mountain.
 mollis, M. A. C.—Wake to Lincoln and Gaston Counties.
- CERCIS Canadensis, L. (Red Bud.)—Low. and Mid. Dist.
- CASSIA occidentalis, L.—Low. Dist.
 obtusifolia, L.—All the Districts.
 Marilandica, L. (Wild Senna.)—Common.
 Chamaecrista, L.—Coast to Cherokee.
 nictitans, L.—Do.
- GLEDITSCHIA triacanthos, L. (Honey Locust.)—All the Districts.
- GYMNOCLADUS Canadensis, Lam. (Coffee Tree.)—Mid. Dist., partially naturalized.
- SCHIRANKIA angustata, Tor. & Gr. (Sensitive Plant.)—Low. and Mid. Dist.
 angustata, var. brachycarpa, Chapm.—Do.

ROSACEÆ.

- PRUNUS Americana, Marsh. (Red Plum.)—Coast to Cherokee.
 Chicasa, Michx. (Chickasaw Plum.)—Common about settlements.
 spinosa, L. ? (Sloc.)—Lincoln Co. (*Dr. Hunter.*)
 Pennsylvanica, L. (Wild Red Cherry.)—High mountains.
 serotina, Ehrh. (Wild Cherry.)—Common.
 Caroliniana, Ait. (Mock Orange.)—Sea-coast of Brunswick County.
- SPIRÆA opulifolia, L. (Nine Bark.)—Western part of the State.
 tomentosa, L. (Hardhack.)—Coast to the mountains.
 salicifolia, L. (Queen of the Meadow.)—Mid. and Up. Dist.
 lobata, Murr. (Queen of the Prairie.)—Mountains south of the French Broad.
 Arnica, L. (Goat's Beard.)—Mid. and Up. Dist.
- GILLENIA trifoliata, Mœnch. (Indian Physic.)—Mid. and Up. Dist.
 stipulacea, Nutt. (American Ipecac.)—Do., but rare.
- AGRIMONIA Eupatoria, L. (Feverfew.)—Common.
 parviflora, Ait.—Do.
- SANGUISORBA Canadensis, L. (Wild Burnet.)—Mountain valleys.

ALCHEMILLA arvensis, L. (Parsley Piert.)—Streets of Oxford, Bath, Washington and Plymouth.

GEUM album, Gmel. (Avens.)—All the Districts.

geniculatum, Michx.—Sides of the higher mountains.

radiatum, Michx.—Tops of the higher mountains.

WALDSTEINIA fragarioides, Tratt. (Barren Strawberry.)—Mid. and Up. Dist.

POTENTILLA Norvegica, L.—Rare, in all the Districts.

Canadensis, L. (Five Finger.)—Very common.

tridentata, Ait. (Mountain Five Finger.)—Rocky summits of mountains.

FRAGARIA Virginiana, Ehrh. (Strawberry.)—All the Districts.

Indica, Ait. (Indian Strawberry.)—Low. and Mid. Dist.

RUBUS odoratus, L. (Flowering Raspberry.)—Mid. Dist.

occidentalis, L. (Purple Raspberry.)—Mid. Dist.

villosus, Ait. (High Blackberry.)—Common.

cuneifolius, Pursh, (Low Blackberry.)—Common in old fields and on road sides.

trivialis, Michx. (Dewberry.)—Common.

hispidus, L. (Swamp Blackberry.)—Swamps in the mountains.

ROSA Carolina, L. (Swamp Rose.)—Common, mostly in wet grounds.

lucida, Ehrh. (Wild, or Dwarf Rose.)—Common in dry woods.

rubiginosa, L. (Sweet Brier.)—Near settlements.

lævigata, Michx. (Cherokee Rose.)—Low. Dist.

CRATÆGUS spathulata, Michx. (Narrow-leaved Thorn.)—Low. and Mid. Dist.

flava, Ait. (Summer Haw.)—Do.

glandulosa, Michx. (Hairy Thorn.)—Common.

parvifolia, Ait. (Dwarf Thorn.)—Do.

tomentosa, Linn. (Black Thorn.)—Mid. and Up. Dist.

“ *var. punctata*, Gray.—Tops of Mountains.

coccinea, L. (Scarlet Haw.)—Mid. and Up. Dist.

cordata, Ait. (Washington Thorn.)—Mid. Dist.

apiifolia, Michx. (Parsley-leaved Haw.)—Low. and Mid. Dist.

Crus-galli, L. (Cockspur Thorn.)—Common.

PYRUS coronaria, L. (Crab Apple.)—Vallies of the mountains.

PYRUS angustifolia, Ait. (Narrow-leaved Crab.)—Low. and Mid. Dist.

arbutifolia, L. (Chokeberry.)—Low. and Mid. Dist.

“ var: *melanocarpa*.—Mountains.

Americana, D. C. (Mountain Sumach. Wine Tree. Mountain Ash.)—Mountains.

AMELANCHIER Canadensis, L. (Service Tree.)—Common.

CALYCANTHACEÆ.

CALYCANTHUS floridus, L. (Sweet Shrub.)—Mountains.

lœvigatus, Willd.—Mid. and Up. Dist.

glauca, Willd.—From Lincoln westward.

MELASTOMACEÆ.

RHEXIA Mariana, L.—Common.

“ var: *lanceolata*.—Low. Dist.

Virginica, L.—Mid. and Up. Dist.

glabella, Michx. (Deer Grass.)—Low. Dist.

ciliosa, Michx.—Low. and Mid. Dist.

lutea, Walt.—Low. Dist.

LYTHRACEÆ.

LYTHRUM alatum, Pursh. (Loosestrife.)—Low. Dist.

lineare, L.—Low. Dist.

HYPOBRYCHIA Nuttallii, Tor. & Gr.—Near Lincolnton.

AMMANIA humilis, Michx.—Mid. Dist.

“ var: *ramosior*.—Low. Dist.

NESÆA verticillata, H. B. & K. (Swamp Loosestrife.)—Low. Dist.

CUPHEA viscosissima, Jacq.—Mid. Dist.

ONAGRACEÆ.

GAURA biennis, L.—Mid. Dist., and Buncombe to Cherokee.

angustifolia, Michx.—Low. Dist.

OENOTHERA biennis, L. (Evening Primrose.)—Common, mostly in plantations.

sinuata, L.—Low. and Mid. Dist.

“ var: *humifusa*.—Sea-beach.

glauca, Michx.—Mid. and Up. Dist.

riparia, Nutt.—Low. Dist.

fruticosa, L. (Sundrops.)—Common.

“ var: *ambigua*.—Mountains.

linearis, Michx.—Mid. and Up. Dist.

- OENOTHERA* *pumila*, L.—Up. Dist.
- EPILOBIUM* *angustifolium*, L. (Willow Herb.)—Mountains.
coloratum, Muhl.—All the Districts.
palustre, L.—Mountains.
- JUSSIEA* *decurrens*, D. C.—Common.
- LUDWIGIA* *alternifolia*, L. (Seed Box.)—Common.
virgata, Michx.—Low. Dist.
hirtella, Raf.—Do.
linearis, Walt.—Do.
linifolia, Poir.—Do.
pilosa, Walt.—Low. and Mid. Dist.
sphaerocarpa, Ell.—Low. Dist. Rare.
capitata, Michx.—Do.
alata, Ell.—Do.
microcarpa, Michx.—Do.
palustris, Ell. (Water Purslane.)—Common.
natans, Ell.—Low. Dist.
arenata, Walt.—Do.
- CIRCEA* *Lutetiana*, L. (Enchanter's Nightshade.)—Mid. and Up. Dist.
alpina L.—Lincoln to Cherokee.
- PROSERPINACA* *palustris*, L. (Mermaid Weed.)—Low. Dist.
pectinacea, Lam.—Low. Dist.
- MYRIOPHYLLUM* *verticillatum*, L. (Water Milfoil.)—Low. Dist.
heterophyllum, Michx.—Low. Dist.
scabratum, Michx.—Mid. Dist.

CACTACEÆ.

- OPUNTIA* *vulgaris*, Mill. (Prickly Pear.)—Low. and Mid. Dist.

GROSSULACEÆ.

- RIBES* *Cynosbati*, L. (Prickly Gooseberry.)—Mountains.
rotundifolium, Michx. (Smooth Gooseberry.)—Do.
gracile, Michx. (Slender Gooseberry.)—Do.
prostratum, L'Her. (Fetid Currant.)—Do.
resinosum, Pursh. (Bristly Currant.)—Do.

TURNERACEÆ.

- PERIQUETA* *fulva*, Chapm.—Near Newbern. (*Croom*.)

PASSIFLORACEÆ.

- PASSIFLORA* *incarnata*, L. (May Pop.)—Common.

PASSIFLORA lutea, L.—All the Districts.

CUCURBITACEÆ.

LAGENARIA vulgaris, Sering. (Gourd.)—About settlements.

MELOTHRIA pendula, L.—Low. Dist.

SICYOS angulatus, L. (One-seeded Cucumber.)—Banks of the Catwba, Lincoln.

CRASSULACEÆ.

SEDUM telephioides, Michx. (Wild Orpine.)—Rocky summits of mountains.

ternatum, Michx. (Three-leaved Stone Crop.)—Mid. and Up. Dist.

pulchellum, Michx. (Mountain Moss.)—Mountains.

DIAMORPHA pusilla, Nutt.—Dunn's mountain, Rowan; and Franklin county. (*Rev. J. B. Cheshire.*)

PENTHORUM sedoides, L. (Ditch Stone Crop.)—Common.

SAXIFRAGACEÆ.

SAXIFRAGA lucanthemifolia, Michx.—Mountains.

erosa, Pursh. (Lettuce Saxifrage.)—Mountain streams.

Virginicensis, Pursh. (Early Saxifrage.)—All the Districts.

Careyana, Gray. (Carey's Saxifrage.)—Mountains.

Caroliniana, Gray. (Carolina Saxifrage.)—Do.

HEUCHERA Americana, L. (Alum Root.)—Low. and Mid. Dist.

villosa, Michx.—Mountains.

Curtisii, Gray.—Buncombe Co.

pubescens, Pursh.—Mountains.

hispida, Pursh.—Do.

BOYKINIA aconitifolia, Nutt.—Mountains.

ASTILBE decandra, Don. (False Goat's Beard.)—Mountain sides.

TIARELLA cordifolia, L. (False Mitre Wort.)—Mid. and Up. Dist.

MITELLA diphylla, L. (Mitre Wort.)—Mountains.

CHRYSOSPLENIUM Americanum, Schwein. (Golden Saxifrage.)—Haywood county.

ITEA Virginica, L.—Coast to Lincoln.

HYDRANGEA arborescens, L. (Wild Hydrangea.)—Mid. and Up. District.

radiata, Walt. (Snowy Hydrangea.)—Mountain.

DECUMARIA barbara, L.—Low. Dist.

PHILADELPHUS grandiflorus, Willd. (Syringa).—Hickory Gap.
hirsutus, Nutt. (Rough Syringa).—French Broad
 River.

HAMAMELACEÆ.

HAMAMELIS Virginica, L. (Witch Hazel).—Common.
FOTHERGILLA alnifolia, L. (Dwarf Alder).—Coast to Lincoln.
LIQUIDAMBAR styraciflua, L. (Sweet Gum).—All the Districts.

UMBELLIFERÆ.

HYDROCOTYLE Americana, L. (Penny Wort).—Up. Dist.
umbellata, L. (Water Grass).—Common.
ranunculoides, L.—Low. Dist.
interrupta, Muhl.—Do.
repanda, Pers.—Do.
CRANTZIA lineata, Nutt.—Low. Dist.
SANICULA Marilandica, L. (Sanicle).—Common.
Canadensis, L.—Do.
ERYNGIUM yuccæfolium, Michx. (Button Snake-root).—Common.
Virginianum, Lam.—Low. Dist.
præaltum, Gray.—Do.
virgatum, Lam.—Common.
DAUCUS pusillus, Michx. (Dwarf Carrot).—Low. Dist.
Carota, L. (Carrot).—Occasionally naturalized.
CICUTA maculata, L. (Water Hemlock. Wild Parsnip).—Common.
PASTINACA sativa, L. (Parship).—About settlements.
CRYPTOTÆNIA Canadensis, D. C. (Honewort).—Mid. Dist.
LEPTOCAULIS divaricatus, D. C.—Low. Dist.
DISCOPLEURA capillacea, D. C. (Bishop Weed).—Low. and Mid.
 District.
Sium lineare, Michx. (Water Parsnip).—Mid. Dist.
BUPLEURUM rotundifolium, L. (Thorough-Wax).—Mid. Dist. Spar-
 ingly naturalized.
ZIZIA integrifolia, D. C.—Lincoln and westward.
THASPIUM barbinode, Nutt.—Common.
pinnatifidum, Gray.—French Broad and Sugar Town
 Rivers. (*Buckley*)
aureum, Nutt. (Meadow Parsnip).—Common.
trifoliatum, Gray.—Mid. and Up. Dist.
LEGUSTICUM actæifolium, Michx. (Angelico).—Mid. and Up. Dist.
ANGELICA Curtisii, Buckl.—Sides of mountains.

- ARCHANGELICA hirsuta, Tor. & Gr.—Mid. and Up. Dist.
 CONTIOSELINUM Canadense, Tor. and Gr. (Hemlock Parsley.)—
 Grandfather Mt. (*Prof. Gray.*)
 TIEDEMANNIA teretifolia, D. C. (Water Drop-wort.)—Low. Dist.
 ARCHEMORA rigida, D. C. (Cowbane. Pig Potatoe.)—Common.
 ternata, Nutt.—Low. Dist.
 HERACLEUM lanatum, Michx. (Cow Parsnip.)—Mountain valleys.
 CHÆROPHYLLUM procumbens, Lam. (Chervil.)—Mid. Dist.
 OSMORHIZA brevistylis, D. C. (Sweet Cicely.)—Mid. and Up. Dist.

ARALIACEÆ.

- ARALIA racemosa, L. (Spikenard.)—Mountains.
 hispida, Michx. (Rough Sarsaparilla.)—Do.
 nudicaulis, L. (Wild Sarsaparilla.)—Do.
 spinosa, (Prickly Ash. Hercules Club.)—Coast to Cherokee-
 PANAX quinquefolium, L. (Ginseng. Sang.)—Mountains.
 trifolium, L. (Dwarf Ginseng.)—Newbern. (*Mr. Croom.*)

CORNACEÆ.

- CORNUS alternifolia, L'Her.—Mountains.
 strieta, Lam.—Low. Dist.
 paniculata, L'Her.—Mountains.
 sericea, L. (Swamp Dogwood.)—Mid. and Up. Dist.
 florida, L. (Dogwood.)—Common.
 NYSSA multiflora, Wang. (Sour Gum.)—Low. and Mid. Dist.
 aquatica, L. (Black Gum.)—Do.
 uniflora, Walt. (Cotton Gum.)—Low. Dist.

CAPRIFOLIACEÆ.

- SYMPHORICARPUS vulgaris, Michx. (Coral Berry.)—Mid. Dist.
 DIERVILLA trifida, Mœench. (Bush Honeysuckle.)—Mountains.
 sessilifolia, Buckl.—Mountains.
 LONICERA sempervirens, Ait. (Woodbine.)—Common.
 grata, Ait. (Yellow Woodbine.)—Mountains.
 parviflora, Lam. (Small Woodbine.)—Do.
 TRIOSTEUM perfoliatum, L. (Genson. Horse Gentian.)—Mid. and
 Up. Dist.
 angustifolium, L.—Lincoln and westward.
 SAMBUCUS Canadensis, L. (Elder.)—Common.
 pubens, Michx. (Red-berried Elder.) High mountains.
 VIBURNUM prunifolium, L. (Black Haw.)—Common.

- VIBURNUM** *Lentago*, L. (Sheep Berry.)—Mountains.
obovatum, Walt.—Low. Dist. Rare.
acerifolium, L. (Maple-leaved Arrow-wood.)—Mid. and Up. Dist.
nudum, L. (Possum Haw. Shawnee Haw.)—Common.
dentatum, L. (Arrow-wood.)—Low. and Mid. Dist.
pubescens, Pursh. (Downy Arrow-wood.)—Mountains.
lantanoides, Michx. (Hobble Bush. Tangle Legs.)—Do.

RUBIACEÆ.

- GALIUM** *hispidulum*, Michx.—Low. Dist.
trifidum, L. (Small Bedstraw.)—Common.
triflorum, Michx. (Sweet Bedstraw.)—Mid. and Up. Dist.
pilosum, Ait.—Common.
circæzans, Michx. (Wild Liquorice.)—Low. and Mid. Dist.
latifolium, Michx.—Mountains.
DIODIA *Virginiana*, L. (Button-weed.)—Low. and Mid. Dist.
teres, Walt.—Common.

CEPHALANTHUS *occidentalis*, L. (Button Bush. Box.)—Common.

MITCHELLA *repens*, L. (Wild Running Box.)—Common.

OLDENLANDIA *cœrulea*, Gray. (Bluets.)—Common.

serpyllifolia, Gray.—Mountains.

purpurea, Gray.—Common.

“ var: *longifolia*, Gr.—Do.

“ var: *tenuifolia*, Gr.—Mountains.

glomerata, Michx. Low. Dist.

SPIGELIA *Marilandica*, L. (Pink Root.)—Low. and Mid. Dist. Rare.

MITREOLA *petiolata*, Tor. & Gr. (Mitre Wort.)—Low. Dist.

sessilifolia, Tor. & Gr.—Low. Dist.

POLYPREMUM *procumbens*, L.—Low. and Mid. Dist.

GELSEMIUM *sempervirens*, Ait. (Yellow Jessamine.)—Low. and Mid. Dist.

VALERIANACEÆ.

FEDIA *radiata*, Michx. (Lamb Lettuce.)—Low. and Mid. Dist.

COMPOSITÆ.

VERNONIA *oligophylla*, Michx.—Mid. Dist.

Novæboracensis, Willd. (Iron-weed.)—Common.

fasciculata, Michx.—Mid. Dist.? (*Prof. Mitchell*.)

angustifolia, Michx.—Low. Dist.

ELEPHANTOPUS Carolinianus, Willd. (Elephant's foot.)—Low. and Mid. Dist.

tomentosus, L.—Low. and Mid. Dist.

SCLEROLEPIS verticillata, Cass.—Low. Dist.

CARPHEPHORUS tomentosus, Tor. & Gr.—Low. Dist.

corymbosus, T. & G.—Low. Dist.

bellidifolius, T. & G.—Do.

LIATRIS squarrosa, Willd. (Blazing Star.)—Low. and Mid. Dist.

tenuifolia, Nutt.—Low. Dist.

pauciflora, Pursh.—Do.

graminifolia, Willd.—Common.

spicata, Willd. (Button Snake Root.)—Common.

pilosa, Willd.—Henderson Co.

scariosa, Willd.—Mid. and Up. Dist.

heterophylla, Br.—Anson Co.

odoratissima, Willd. (Vanilla Plant.)—Low. Dist.

paniculata, Willd.—Low. Dist.

KUHnia eupatorioides, L.—Common.

EUPATORIUM purpureum, L. (Trumpet Weed.)—Common.

hyssopifolium, L.—Common.

leucolepis, Tor. & Gr.—Low. Dist.

cuneifolium, Willd.—S. E. part of the State.

parviflorum, Ell.—Low. Dist. ? (*Prof. Mitchell*.)

rotundifolium, L.—Low. and Mid. Dist.

teucrifolium, Willd.—Common.

album, L.—Common.

altissimum, L.—Lincoln and westward.

sessilifolium, L. (Upland Boneset.)—Mid. and Up. Dist.

pinnatifidum, Ell.—Low. Dist.

perfoliatum, L. (Wild Sage. Boneset. Thoroughwort.)—Common.

serotinum, Michx.—Low. and Mid. Dist.

ageratoides, L. (Rich Weed.)—Mountain sides.

aromaticum, L. (Wild Horehound.)—Common.

incarnatum, Walt.—Low. Dist.

feniculaceum, Willd. (Dog Fennel.)—Low. and Mid. Dist.

coronifolium, Willd. (Dog Fennel.)—Do.

MIKANIA scandens, Willd. (Climbing Hemp-weed.)—Common.

CONOCLINIUM *celestinum*, D. C. (Mist Flower.)—Low. Dist.

SERICOCARPUS *conyzoides*, Nees. (White-topped Aster.)—Low. and Mid. Dist.

solidagineus, Nees.—Low. and Mid. Dist.

tortifolius, Nees. (Rattlesnake's Master.)—Low. Dist.

ASTER *corymbosus*, Ait. (Starwort. Aster.)—Up. Dist.

macrophyllus, L.—Lincoln and westward.

spectabilis, Ait.—Low. Dist.

gracilis, Nutt.—Mid. Dist.

surreculosus, Michx.—Low. and Up. Dist.

paludosus, Ait.—Low. Dist.

sericeus, Vent.—Up. Dist.

concolor, L.—All the Districts.

squarrosus, Walt.—Low. Dist.

patens, Ait.—Common.

lævis, L.—Mid. and Up. Dist.

gracilentus, Tor. & Gr.—Lincoln.

concinus, Willd.—Mid. Dist. ? (*Schweinitz*.)

undulatus, L.—Common.

cordifolius, L.—Mountains.

sagittifolius, Willd.—Mid. and Up. Dist.

ericoides, L.—Mid. and Up. Dist.

“ var: *villosus*.—Do.

“ var: *platyphyllus*.—Mid. Dist.

multiflorus, Ait.—Up. Dist.

dumosus, L.—Common.

Tradescanti, L.—Up. Dist.

miser, L.—Common.

simplex, Willd.—Low. Dist.

tenuifolius, L.—Up. Dist.

carneus, Nees ?—Low. Dist.

Novi-Belgii, L.—Low. Dist.

longifolius, Lam.—Do.

Elliotii, Tor. & Gr.—Do.

puniceus, L.—Mid. and Up. Dist.

prenanthoides, Muhl.—Mountains.

grandiflorus, L.—Mid. and Up. Dist.

Curtisii, Tor. & Gr.—Mountains.

Novæ-Angliæ, L.—Low. Dist.

- ASTER** *acuminatus*, Michx.—Mountains.
flexuosus, Nutt.—Salt Marshes.
linifolius, L.—Do.
- ERIGERON** *strigosum*, Muhl. (Daisy Fleabane.)—Common.
Canadense, L. (Horse-weed. Hog-weed.)—Common.
Philadelphicum, L. (Fleabane.)—Do.
bellidifolium, Muhl. (Robin's Plantain.)—Do.
vernum, Tor. & Gr.—Low. Dist.
- DIPLOPAPPUS** *linariifolius*, Hook.—Common.
cornifolius, Darl.—Mountains.
amygdalinus, Tor. & Gr.—Mid. and Up. Dist.
umbellatus, T. & G.—Mountains.
- BOLTONIA** *diffusa*, Ell.—Low. Dist.
glastifolia, L'Her.—Low. & Mid. Dist.
asteroides, L'Her.—Lincoln and westward.
- SOLIDAGO** *squarrosa*, Muhl. (Golden Rod.)—Yancey County.
pubens, M. A. C.—Mecklenburg and westward.
latifolia, L.—Up. Dist.
cæsia, L.—Common.
Curtisii, Tor. & Gr.—Mountains.
monticola, T. & G.—Do.
lancifolia, T. & G.—Mountains.
bicolor, L.—Very common.
puberula, Nutt.—Low. Dist.
 " var. *pulverulenta*.—Do.
petiolaris, Ait.—Low. and Mid. Dist.
speciosa, Nutt.—Mid. and Up. Dist.
verna, M. A. C.—Low. Dist.
glomerata, Michx.—Mountains.
rigida, L.—Mountains.
spithamea, M. A. C.—Summits of highest Mountains.
virgata, Michx.—Low. Dist.
angustifolia, Ell.—Do.
sempervirens, L.—Do.
patula, Muhl.—Up. Dist.
 " var. *strictula*.—Low. Dist.
arguta, Ait. var. *junceæ*.—Low. and Mid. Dist.
Boottii, Hook.—Low. Dist.
altissima, L.—Common.

SOLIDAGO ulmifolia, Muhl.—Up. Dist.

Elliottii, T. & G.—Low. Dist.

pilosa, Walt.—Do.

odora, Ait. (Anise-scented Golden Rod.)—Common.

tortifolia, Ell.—Low. Dist.

cordata, Short.—Mountains.

— *nemoralis*, Ait.—Common.

Canadensis, L.—Mid. & Up. Dist.

serotina, Ait.—Mid. Dist.

gigantea, Ait.—Common.

lanceolata, L.—Low. & Mid. Dist.

tennifolia, Pursh.—Common.

BIGELOVIA nudata, D. C.—Low. Dist.

CHRYSOPSIS graminifolia, Nutt. (Silk Grass. Scurvy Grass.)—Low.
& Mid. Dist.

Mariana, Nutt.—Common.

trichophylla, Nutt.—Low. Dist.

gossypina, Nutt.—Do.

INULA Helenium, L. (Elecampane.)—Up. Dist.

BACCHARIS halimifolia, L. (Groundsel.)—Low. Dist.

glomeruliflora, Pers.—Do.

angustifolia, Michx.—Do.

PLUCHEA bifrons, D. C. (Marsh Fleabane.)—Low. Dist.

fetida, D. C. (Stinking Fleabane.)—Common.

camphorata, D. C.—Low. Dist.

PTEROCALON pycnostachyum, Ell. (Black Root.)—Low. Dist.

POLYMNIA Canadensis, L. (Leaf-cup.)—Mountains.

Uvedalia, L. (Bear's Foot.)—All the Districts.

CHRYSOGONUM Virginianum, L.—Low. and Mid. Dist.

SULPHUR compositum, Michx.—Mid. and Up. Dist.

“ var. *Michauxii*, T. & G.—Low. and Mid.
Districts.

trifoliatum, L.—Up. Dist.

Asteriscus, L.—Mid. Dist.

“ var. *dentatum*.—Do.

perfoliatum, L.—Mountains.

BERLANDIERA tomentosa, T. & G.—Richmond Co. and southward.

PARTHENIUM integrifolium, L.—Common.

Iva frutescens, L. (Marsh Elder.)—Salt Marshes.

Iva imbricata, Walt.—Sea coast.

AMBROSIA trifida, L. (Buffalo Weed.)—Mid. and Up. Dist.

artemisiifolia, L. (Ragweed. Carrot-weed. Stick-weed.)—Common.

XANTHIUM strumarium, L. (Cockle-bur.)—Common.

spinosum, L. (Thorny Cockle-bur.)—In streets of Low. and Mid. Dist.

ECLIPTA erecta, L.—Low. and Mid. Dist.

BORRICHIA frutescens, D. C. (Sea Ox-eye.)—Salt Marshes.

ZINNIA multiflora, D (Zinnia.)—Sparingly naturalized.

HELIOPSIS laevis, Pers. (Ox-eye)—Lincoln and Westward.

ECHINACEA purpurea, Mœnch. (Purple Cone-flower.)—Mid. and Up. Dist.

TETRAGONOTHECA helianthoides, L.—Mid. and Up. Dist.

RUDBECKIA hirta L. (Cone-flower.)—All the Districts.

fulgida, Ait.—Mid. Dist.

triloba L.—Mountains.

laciniata L.—Mid. and Up. Dist.

LEPACHYS pinnata, Tor. & Gr.—Up. Dist.

HELIANTHUS angustifolius, L. (Sunflower.)—Common.

heterophyllus, Nutt.—Low. Dist.

atrorubens, L.—Common.

occidentalis, Riddell; var: *Dowellianus*, T. & G.—Macon Co.

giganteus, L.—Low. and Mid. Dist.

tomentosus, Michx.—Lincoln and westward.

strumosus, L.—Common.

decapetalus, L.—Mid. and Up. Dist.

hirsutus, Raf.—Lincoln and westward.

divaricatus, L.—Mid. and Up. Dist.

microcephalus, T. & G.—Mid. Dist.

Schweinitzii, T. & G.—Mid. Dist.

laevigatus, T. & G.—Lincoln Co.

ACTINOMERIS squarrosa, Nutt.—Mid. and Up. Dist.

COREOPSIS discoidea, T. & G. (Tickseed.)—Low. and Mid. Dist.

aurea, Ait.—Low. Dist.

trichosperma, Michx. (Tickseed Sunflower.)—Low. Dist.

tripteris, L. (Tall Coreopsis.)—Up. Dist.

latifolia, Michx.—Mountains.

COREOPSIS *semifolia*, Michx.—Mid. and Up. Dist.

verticillata, L.—Low. and Mid. Dist.

auriculata, L.—Common.

lanceolata, L.—Mid. Dist.

gladiata, Walt.—All the Districts.

angustifolia, Ait.—Low. Dist.

integrifolia, Poir.—Do.

BIDENS *frondosa*, L.—Low. and Mid. Dist.

chrysanthemoides, Michx. (Bur Marigold.)—Common.

bipinnata, L. (Spanish Needles. Beggar Lice.)—Common.

VERBESINA *Siegesbeckia*, Michx. (Stick weed. Crown-beard.)—

All the Districts.

Virginica, L.—Upper Dist.

HELENIUM *autumnale*, L. (Sneeze-weed)—Common.

quadridentatum, Labill.—Low. Dist.

LEPTOPODA *Helenium*, Nutt.—Mid. Dist.

puberula, Macbr.—Low. Dist.

brevifolia, Nutt.—Do.

brachypoda, T. & Gr.—Do.

BALDWINIA *uniflora*, Ell.—Low. Dist.

MARSHALLIA *latifolia*, Pursh.—Mountains.

lanceolata, Pursh.—All the Districts.

“ var: *platyphylla*, M. A. C.—Mid. Dist.

angustifolia, Pursh.—Low. Dist.

MARUTA *Cotula*, D. C. (May Weed. False Chamomile.)—Streets and road sides.

ACHILLEA *millefolium*, L. (Milfoil. Yarrow.)—About settlements.

LEUCANTHEMUM *vulgare*, Lam. (White Daisy. White-weed.) In grass lands.

TANACETUM *vulgare*, L. (Tansy.)—About settlements.

ARTEMISIA *candata*, Michx. (Wild Wormwood.)—Low. Dist.

vulgaris, L. (Mugwort.)—Mid. Dist. (Nuttall.)

GNAPHALIUM *polyccephalum*, Michx. (Everlasting.)—Common.

purpureum, L. (Cudweed.)—Common.

ANTENNARIA *margaritacea*, R. Br. (Everlasting.)—Mid. and Up. Dist.

plantaginifolia, Hook.—Common.

FILAGO *Germanica*, L. (Cotton Rose.)—Mid. Dist.

ERECTHITES *hieracifolia*, Raf. (Fire-weed.)—Common.

- CACALIA atriplicifolia*, L. (Indian Plantain).—Mid. and Up. Dist.
suaveolens, L.—Henderson Co.
reniformis, Muhl. (Wild Collard).—Mountain sides.
- SENECIO lobatus*, Pers.—Low. Dist.
aureus, L. (Ragwort).—Mid. and Up. Dist.
 “ var: *Balsamitæ*.—Do.
tomentosus, Michx.—Low. and Up. Dist.
Elliottii, T. & G.—Mid. and Up. Dist.
Millefolium, T. & G.—Cæsar’s Head, (*Buckley*.) and
 Whiteside Mt.
- RUGELIA nudicaulis*, Shuttl.—Jackson Co. (*Buckley*.)
- ARNICA nudicaulis*, Ell.—Low. and Mid. Dist.
- CENTAUREA calcitrapa*, L. (Star Thistle).—Mid. Dist.?—(*Prof.*
Mitchell.)
- CIRSIUM lanceolatum*, Scop. (Thistle).—Mid. and Up. Dist.
discolor, Spreng.—Up. Dist.
altissimum, Spreng.—Low. and Mid. Dist.
Nuttallii, D. C.—Mid. Dist.
Virginianum, Michx.—Low. and Mid. Dist.
muticum, Michx. (Swamp Thistle).—Low. Dist.
repandum, Michx.—Sand barrens of Low. Dist.
horridulum, Michx. (Yellow Thistle).—Low. Dist.
 “ var: *Elliottii*, T. & G.—Low. Dist.
- LAPPA major*, Gært. (Burdock).—Mid. and Up. Dist.
- CHAPTALIA tomentosa*, Vent.—Low. Dist.
- KRIGIA Virginica*, Willd.—Low. and Mid. Dist.
Caroliniana, Nutt.—Mid. Dist.
- CYNTHIA Virginica*, Don.—Mid. and Up. Dist.
 Dandelion, D. C.—Mid. Dist.
 “ var: *montana*, Chapm.—Mountains.
- HIERACIUM scabrum*, Michx. (Hawkweed).—Mountains.
Gronovii, L.—Low. to Up. Dist.
venosum, L. (Rattlesnake-weed. Robin’s Plantain).—
 Mid. and Up. Dist.
paniculatum, L.—All the Districts.
- NABALUS albus*, Hook. (White Lettuce. Rattlesnake Root).—
 Common.
altissimus, Hook.—Low. and Mid. Dist.
Fraseri, D. C. (Gall of the Earth).—Low. to Up. Dist.

NABALUS virgatus, D. C.—Low. Dist.

crepidineus, D. C.—Mountains.

TARAXACUM Dens-Leonis, Desf. (Dandelion.)—Common.

PYRRHOPAPPUS Carolinianus, D. C. (False Dandelion.)—Low. and Mid. Dist.

LACTUCA elongata, Muhl. (Wild Lettuce.)—Common.

 “ *var: graminifolia*.—Low. Dist.

 “ *var: sanguinea*.—Lincoln Co.

MULGEDIUM acuminatum, D. C. (Blue Lettuce.)—Common.

Floridanum, D. C.—Common.

leucophæum, D. C.—Mountains.

SONCHUS oleraceus, L. (Sow Thistle.)—Common.

asper, Vill.—Mid. Dist.

LOBELIACEÆ.

LOBELIA cardinalis, L. (Cardinal Flower.)—Common.

syphilitica, L. (Great Lobelia.)—Mid. and Up. Dist.

puberula, Michx. (Blue Lobelia.)—Low. and Mid. Dist.

leptostachys, A. D. C.—Lincoln to Cherokee.

amœna, Michx.—Low. and Mid. Dist.

glandulosa, Walt.—Common.

inflata, L. (Indian Tobacco. Lobelia.)—Mid. and Up. Dist.

spicata, Lam.—Mid. and Up. Dist.

Nuttallii, R. & S.—Low. and Mid. Dist.

paludosa, Nutt.—Low. Dist.

CAMPANULACEÆ.

CAMPANULA Americana, L. (Bell-flower.)—Low. to Up. Dist.

aparinoides, Pursh. (Marsh Bell-flower.)—Mountain Swamps.

divaricata, Michx. (Hare-bell.)—Mountain sides.

flexuosa, Michx.—Mountains. (*Michaux.*)

SPECULARIA perfoliata, A. D. C. (Venus' Looking Glass.)—Common.

 “ *var: Ludoviciana*.—Mid. Dist.

ERICACEÆ.

GAYLUSSEACIA frondosa, Tor. & Gr. (Blue Huckleberry.)—Low. and Mid. Dist.

dumosa, T. & G. (Dwarf Huckleberry.)—Do.

 “ *var: hirtella*.—Do.

- GAYLUSSACIA resinosa*, T. & G. (Black Huckleberry.)—Mid. and Up. Dist.
ursina, Gray. (Bear Huckleberry. Bearberry.)—Haywood county and southward.
- VACCINIUM corymbosum*, L. (Swamp Huckleberry.)—Common.
Constablaei, Gray. (Pale Dwarf Blueberry.)—Summits of mountains.
tenellum, Ait. Low. and Mid. Dist.
hirsutum, Buckl. (Bristly Huckleberry.)—Mountains of Cherokee.—(*Buckley*.)
myrsinites, Michx.—Pine Barrens.
arborescens, Michx. (Sparkleberry.)—Coast to Cherokee.
stamineum, L. (Deerberry. Gooseberry.)—Common.
crassifolium, Andr. (Creeping Huckleberry.)—Low. Dist.
erythrocarpon, Michx.—Higher mountains.
macrocarpon, Ait. (Cranberry.)—Swamps of Low. and Up. Dist.
- EPIGLEA repens*, L. (Trailing Arbutus. Crocus.)—Common.
- GAULTHERIA procumbens*, L. (Mountain Tea. Wintergreen.)—Low. and Up. Dist.
- LEUCOTHOE axillaris*, Don.—Low. Dist.
Catesbaei, Gray. (Dog Laurel.)—Mountains.
racemosa, Gray.—Low. and Mid. Dist.
recurva, Gray.—Near Paint Rock. (*Buckley*.)
- CASSANDRA calyculata*, Don.—Low. Dist.
- ANDROMEDA floribunda*, Pursh. Mountains.—(*Pursh. Buckley*.)
nitida, Bartr. (Fetter Bush.)—Low. Dist.
Mariana, L. (Stagger Bush.)—Low. and Mid. Dist.
speciosa, Michx.—Low. Dist.
lignustrina, Muhl. (Pepper Bush.)—Common.
- OXYDENDRUM arboreum*, D. C. (Sour Wood. Sorrell Tree.)—All the Districts.
- CLETHRA alnifolia*, L. (White Alder. Sweet Pepper Bush.)—Low. and Mid. Dist.
 “ var: *tomentosa*.—Low. Dist.
acuminata, Michx. (Mountain Pepper Bush.)—Mountains.
- KALMIA latifolia*, L. (Ivy.)—All the Districts; rare in the Lower.
angustifolia, L. (Wicky.)—All the Districts.
cuneata, Michx.—Low. Dist.

- MENZIESIA globularis*, Salisb. (Minnie Bush.)—Mountains.
AZALEA nudiflora, L. (Purple Honeysuckle.)—Common.
 calendulacea, Michx. (Yellow Honeysuckle.)—Mountains.
 viscosa, L. (Clammy Honeysuckle.)—Up. Dist.
 “ var: *glauca*.—Mid. Dist.
 arborescens, Pursh. (Smooth Honeysuckle.)—Common.
RHODODENDRON maximum, (Laurel.)—Mid. and Up. Dist.
 Catawbiense, Michx. (Oval-leaved Laurel.)—On
 highest mountains.
 punctatum, Andr. (Dwarf Laurel.)—Mountains.
LEIOPHYLLUM buxifolium, Ell. (Sand Myrtle.)—Mountains, and in
 Brunswick county.
PYROLA rotundifolia, L. (False Wintergreen.)—Low. Dist.
CHIMAPHILA umbellata, Nutt. (Prince's Pine. Pipsissewa.) Low.
 to Up. Dist.
 maculata, Pursh. (Spotted Wintergreen.) Common.
SHORTIA galacifolia, Gray.—Mountains. (*Michaux.*)
SCHWEINITZIA odorata, Ell.—Salem. (*Schweinitz.*) Table mountain.
 (*Prof. Gray.*)
MONOTROPA uniflora, L. (Eye-bright.)—Common.
 Hypopitys, L. (Pine Sap.)—Mid. and Up. Dist.

GALACINEÆ.

- GALAX aphylla*, L. (Colt's Foot.)—Beaufort county to mountains.

AQUIFOLIACEÆ.

- ILEX opaca*, Ait. (Holly.)—Common.
 Dahoon, Walt. var: *myrtifolia*, Chapm. (Dahoon Holly.)—
 Low. Dist.
 Cassine, L. (Yaupon.)—Near the Coast.
 decidua, Walt.—Mid. Dist.
 ambigua, Chapm.—Mountains.
 verticillata, Gray.—Common.
 glabra, Gray. (Gallberry. Inkberry.)—Low. Dist.
 coriacea, Chapm. (Tall Gallberry.)—Do.

STYRACACEÆ.

- STYRAX grandifolia*, Ait. (Mock Orange.)—Coast to Lincoln.
 Americana, Lam.—Low. Dist.
HALESIA tetraptera, L. (Snow-drop Tree.)—All the Districts.
SYMPLOCOS tinctoria, L'Her. (Yellow Wood. Sweet Leaf.)—Com-
 mon.

CYRILLACEÆ.

CYRILLA racemiflora, Walt. (Burn-wood Bark. He Huckleberry.)—Low. Dist.

EBENACEÆ.

DIOSPYROS Virginiana, L. (Persimmon.)—Common.

SAPOTACEÆ.

BUMELIA lycioides, Gært. (Buckthorn.)—Coast to Lincoln Co.

PLANTAGINACEÆ.

PLANTAGO major, L. (Plantain.)—Common.

lanceolata, L. (Narrow-leaved Plantain.)—Common.

sparsiflora, Michx.—Low. Dist.

Virginica, L.—Low. and Mid. Dist.

heterophylla, Nutt.—Low. Dist.

PLUMBAGINACEÆ.

STATICE Caroliniana, Walt. (Marsh Rosemary.)—Salt Marshes.

PRIMULACEÆ.

NOTTONIA inflata, Ell. (Featherfoil.)—Up. Dist.

LYSIMACHIA stricta, Ait. (Loosestrife.)—Common.

“ var: *angustifolia*.—Low. Dist.

Herbemonti, Ell.—Low. Dist.

quadrifolia, L. (Five Sisters.)—Common.

ciliata, L.—All the Districts.

radicans, Hook.—Up. Dist.

longifolia, Pursh.—Do.

DODECATHEON Meadia, L. (American Cowslip.)—Chatham Co.

ANAGALLIS arvensis, L. (Pimpernel.)—Near settlements in all the Districts. Rare.

CENTUNCULUS minimus, L. (Chaffweed.)—Davidson Co.

SAMOLUS floribundus, Kth. (Brook-weed.)—Low. Dist.

LENTIBULACEÆ.

UTRICULARIA inflata, Walt. (Bladder-wort.)—Low. Dist.

vulgaris, L.—Mid. Dist.

striata, Leconte.—Low. Dist.

fibrosa, Walt.—Do.

gibba, L.—Do.

purpurea, Walt.—Low. Dist.

UTRICULARIA cornuta, Michx.—Do.

subulata, L.—Low. and Mid. Dist.

PINGICULA lutea, Walt. (Butter-wort.)—Low. Dist.

elatio, Michx.—Do.

BIGNONIACEÆ.

BIGNONIA capreolata, L. (Cross Vine.)—Low. & Mid. Dist.

TECOMA radicans, Juss. (Trumpet Flower.)—Coast to the Mountains.

CATALPA bignonioides, Walt. (Catalpa.)—About settlements.

MARTYNIA proboscidea, Glox. (Martino. Unicorn Plant.)—About settlements.

OROBANCHACEÆ.

EPIPHEGUS Virginiana, Bart. (Beech Drops.)—Common.

CONOPHOLIS Americana, Wallr. (Squaw-root.)—Low. & Mid. Dist.

APHYLLON uniflorum Tor. & Gr. (Cancer-root.)—Mid. Dist. (*Prof. Mitchell*.)

SCROPHULARIACEÆ.

VERBASCUM *Thapsus*, L. (Mullein.)—Common.

Blattaria, L. (Moth Mullein.)—Do.

SCROPHULARIA nodosa, L. (Fig-wort.)—All the Districts.

CHELONE glabra, L. (Snake-mouth.)—Common.

Lyonii, Pursh.—Mountain sides.

PENSTEMON pubescens, Soland. (Beard-tongue.)—Common.

“ var: *lævigatus*.—Common.

LINARIA Canadensis, Spreng. (Toad Flax.)—Low. & Mid. Dist.

vulgaris, Mill. (Butter & Eggs.)—Roadsides.

Elatine, Mill.—Roadsides in Orange, Co.

MIMULUS ringens, L. (Monkey Flower.)—Common.

alatus, Ait.—Lower? & Mid. Dist.

HERPESTIS nigrescens, Benth.—Low. Dist.

Monniera, H. B. & K.—Low. Dist.

amplexicaulis, Pursh.—Do.

GRATIOLA Virginiana, L. (Hedge Hyssop.)—Low. & Mid. Dist.

sphaerocarpa, Ell.—Low. & Mid. Dist.

viscosa, Schwein.—Lincoln & Surry.

aurea, Muhl.—Low. Dist.

pilosa, Michx.—Low. & Mid. Dist.

ILYSANTHES gratioloides, Benth. (False Pimpernel.)—Common.

refractu, Benth.—Surry (*Gray*) to Henderson, Co. (*Buckley*.)

- ILYSANTHES saxicola, Chapm.—Rocks in Hiwassee River.
 MICRANTHEMUM orbiculatum, Michx.—Low. Dist.
 VERONICA Virginiana, L. (Culver's Physic.)—Mid. & Up. Dist.
 officinalis, L. (Speedwell.)—Mountains.
 serpyllifolia, L. (Paul's Betony.)—Common.
 peregrina, L. (Purslane Speedwell.)—Do.
 arvensis, L. (Corn Speedwell.)—Low. & Mid. Dist.
 agrestis, L. (Field Speedwell.)—Up. Dist.
 BUCHNERA Americana, L. (Blue Hearts.)—Mid. & Up. Dist.
 SEYMERIA tenuifolia, Pursh.—Low. & Mid. Dist.
 pectinata, Pursh.—Low. Dist. (*Croom.*)
 OTOPHYLLA Michauxii, Benth.—Up. Dist.
 DASYSTOMA pubescens, Benth. (False Foxglove.)—Common.
 quercifolia, Benth.—Mid. & Up. Dist.
 pedicularia, Benth.—Mid. Dist.
 pectinata, Benth.—Low. & Mid. Dist.
 GERARDIA linifolia, Nutt. (Flax leaved Gerardia.)—Low. Dist.
 divaricata, Chapm.—Do.
 aphylla, Nutt.—Low. Dist.
 purpurea, L. (Purple Gerardia.)—Common.
 “ var: fasciculata,—Low. Dist.
 maritima, Raf.—Sea-beach.
 setacea, Ell.—Low. Dist.
 tenuifolia, Vahl.—Common.
 parvifolia, Chapm.—Low. Dist.
 CASTILLEJA coccinea, Spreng. (Painted Cup.)—Mid. & Up. Dist.
 SCHWALBEA Americana, L. (Chaff Seed.)—Low. Dist.
 PEDICULARIS Canadensis, L. (Lousewort.)—All the Districts.
 lanceolata, Michx.—Mountains.
 MELAMPYRUM Americanum, Michx. (Cow Wheat.)—Mountains.

ACANTHACEÆ.

- DIPTERACANTHUS strepens, Nees.—Common.
 DIANTHERA Americana, L. (Water Willow.)—Mid. and Up. Dist.
 ovata, Walt.—Low. Dist.
 DICLIPTERA brachiata, Spreng.—Low. Dist.

VERBENACEÆ.

- VERBENA urticifolia, L. (White Vervain.)—Common.
 hastata, L. (Blue Vervain.)—Do.

VERBENA angustifolia, Michx.—Mid. Dist.

Caroliniana, Michx.—Low. Dist.

officinalis, L. (Vervain.)—Common.

LIPPIA nodiflora, Michx. (Fog-fruit.)—Low. Dist.

CALLICARPA Americana, L. (Bermuda Mulberry.)—Low. Dist.

PHYRMA leptostachya, L. (Lop-seed.)—Mid. and Up. Dist.

LABIATÆ.

HYPTIS radiata, Willd.—Low. and Mid. Dist.

MENTHA *viridis*, L. (Spear-mint.)—Common.

piperita, L. (Peppermint.)—Common.

rotundifolia, L. (Round-leaved Mint.)—Low. Dist. Rare.

LYCOPUS Virginicus, L. (Bugle-weed.)—Common.

sinuatus, Ell.—Low. Dist.

CUNILA Mariana, L. (Dittany.)—Mid. and Up. Dist.

PHYCNANTHEMUM incanum, Michx. (Mountain Mint.)—Mid. and Up. Dist.

„ var: Tullia.—Common.

dubium, Gray.—Mountains. (*Gray*.)

aristatum, Michx.—Low. Dist.

„ var. *hyssopifolium*.—Do.

pilosum, Nutt.—Mountains. (*Prof. Gray*.)

muticum, Pers.—Mountains.

lanceolatum, Pursh.—Low. and Mid. Dist.

linifolium, Pursh.—Common.

undum, Nutt.—Mountains.

montanum, Michx.—Do.

COLLINSONIA Canadensis, L. (Horse Balm.)—Mid. and Up. Dist.

punctata, Ell.—Low. Dist.

ovalis, Pursh.—Mountains.

HEDEOMA pulegioides, Pers. (Penny Royal.)—Mid. and Up. Dist.

CALAMINTHA *Nepeta*, Link. (Basil Thyme.)—Common about streets.

Caroliniana, Sweet.—Low. Dist.

MELISSA *officinalis*, L. (Balm.)—Mid. Dist. Rare.

SALVIA *arcticifolia*, L. (Wild Sage.)—Mid. and Up. Dist.

lyrata, L.—Common.

Claytoni, Ell.—Mid. Dist.

MONARDA didyma, L. (Horse Mint.)—Mountains.

fistulosa, L.—Common.

punctata, L. (Rignum.)—Common.

- MONARD** *gracilis*, Pursh.—Mountains. (*Lyon*.)
BLEPHILIA *ciliata*, Raf. (Horse Mint).—Mid. Dist.
 hirsuta, Benth.—Mountains.
LOPHANTHUS *nepetoides*, Benth. (Giant Hyssop).—Mid. and Up.
 Dist.
 scrophulariaefolius, Benth.—Mountains.
NEPETA *Cataria*, L. (Catnip).—Common about settlements.
 Glechoma, Benth. (Ground Ivy).—Near settlements.
CEDRONELLA *cordata*, Benth.—Ashe Co. (*Prof. Gray*.)
BRUNELLA *vulgaris*, L. (Heal-all).—Common.
SCUTELLARIA *versicolor*, Nutt. (Skullcap).—Up. Dist.
 arguta, Buckl.—Black Mt. (*Buckley*.)
 serrata, Andr.—Mid. Dist.
 pilosa, Michx.—Low. & Mid. Dist.
 integrifolia, L.—Low. Dist.
 lateriflora, L.—Low. Dist.
 galericulata, L.—Mid. Dist.
 parvula, Michx.—Mid. Dist.
 saxatilis, Riddell.—Mountains.
MACBRIDEA *pulchra*, Ell.—Low. Dist. Rare.
PHYSOSTEGIA *Virginiana*, Benth. (Dragon-head).—All the Districts.
LAMium *amplexicaule*, L. (Dead Nettle. Hen bit).—Common in
 Gardens.
MARRUBIUM *vulgare*, L. (Horehound).—Common about settlements.
LEONURUS *Cardiaca*, L. (Mother-wort).—Do.
STACHYS *aspera*, Michx. (Hedge Nettle).—Mountains.
 hyssopifolia, Michx.—Low. Dist.
ISANTHUS *cœruleus*, Michx. (False Penny Royal).—Mid. & Up. Dist.
TRICHOSTEMA *dichotomum*, L. (Blue Curls).—Common.
 “ *var. lineare*.—Mid. Dist.
TEUCRUM *Canadense*, L. (Wood Sage).—Low. & Mid. Dist.

BORRAGINACEÆ.

- HELIOTROPUM** *Chrassavicum*, L. (Heliotrope).—Low. Dist. near the
 coast.
HELIOPHYTUM *Indicum*, D. C. (Indian Heliotrope).—Low. & Mid.
 Dist.
ECHINUM *vulgare*, L. (Blue-weed).—Mid. Dist. Rare.
OXOSMODIUM *Carolinianum*, D. C. (Gromwell).—Up. Dist.

- OXOSMODIUM Virginianum*, D. C.—Low. & Mid. Dist.
LITHOSPERMUM arvense, L. (Corn Gromwell.)—Low. and Mid. Dist.
 hirtum, Lehm. (Hairy Puccoon.)—Low. Dist.
MERTENSIA Virginica, D. C. (Roanoke Bell. Virginia Cowslip.)—
 Halifax, Co. (*T. B. Hill*.) Mts.
CYNOGLOSSUM officinale, L. (Hound's Tongue.)—Mid. Dist.
 Virginicum, L. (Wild Comfrey.)—Mid. & Up. Dist.
 Morisoni, D. C. (Beggars Lice.)—Do.
MYOSOTIS laxa, Lehm. (Forget me not.)—Low. & Mid. Dist. Rare.
 verna, Nutt.—Mid. & Up. Dist.

HYDROPHYLLACEÆ.

- HYDROPHYLLUM Virginicum*, L. (Water-leaf.)—Mountains.
 Canadense, L.—Mountains.
ELLISIA Nyctelea, L.—Mid. Dist. (*Prof. Mitchell*.)
NEMOPHILA microcalyx, F. & M.—Up. Dist.
PHACELIA bipinnatifida, Michx.—Up. Dist.
 Purshii, Buckl.—Mountains. (*Buckley*.)
 fimbriata, Michx.—Mountains.
 parviflora, Pursh.—Low. Dist.

HYDROLEACEÆ.

- HYDROLEA quadrivalvis*, Walt.—Low. Dist.

POLEMONIACEÆ.

- PHLOX paniculata*, L. (Phlox.)—Lincoln & westward.
 “ var: *acuminata*.—Mountains.
 maculata, L.—Common.
 Carolina, L.—Mountains.
 glaberrima, L.—Mid. & Up. Dist.
 reptans, Michx.—Lincoln & westward.
 divaricata, L.—Common.
 Walteri, Chapm.—Low. & Mid. Dist.
 pilosa, L.—Mecklenburg & westward.
 subulata, L. (Wild Pink.)—Low. Dist. to Mountains.
POLEMONIUM reptans, L. (Greek Valerian.)—Haywood Co.
PYXIDANTHERA barbulata, Michx. (Flowering Moss.)—Low. Dist.

CONVOLVULACEÆ.

- QUAMOCLIT coccinea*, Mœnch.—Common in cultivated grounds.
PHARBITIS Nil, Choix. (Morning Glory.)—Do.

Ipomœa commutata, R. & S.—All the Districts.
pandurata, Meyer. (Wild Potatoe.)—Coast to Cherokee.
sagittifolia, Bot. Reg.—Low. Dist.
lacunosa, L.—Low. Dist.

Calystegia sepium, R. Br. (Bindweed.)—Common.
spithamea, Pursh. (Low Bindweed.)—Mid. Dist.

Stylisma humistrata, Chapm.—Low. Dist.
aquatica, Chapm.—Do.
Pickeringii, Gray.—Do.

Dichondra repens, Forst. var: *Carolinensis*, Choix.—Low. Dist.

Cuscuta arvensis, Beyr. (Love Vine. Dodder.)—Mid. Dist.
Gronovii, Willd.—Low. and Mid. Dist.
rostrata, Shuttl.—Mountains.
compacta, Juss.—All the Districts.
epilinum, Weille. (Flax Dodder.)—Orange County.

SOLANACEÆ.

Solanum nigrum, L. (Nightshade.)—Common near settlements.
Carolinense, L. (Horse Nettle.)—Common.
aculeatissimum, Jacq. (Soda Apple.)—Low. Dist.

Physalis viscosa, L. (Ground Cherry.)—Common.
lanceolata, Michx.—On the coast.
angulata, L.—Waste Grounds of Low. Dist.
pubescens, L.—Do.

Nicandra physaloides, Gaert. (Apple of Peru.)—Waste grounds.

Datura Stramonium, L. (Jamestown Weed.)—Common.

“ var: *Tatula*.—Common.
Metel, L.—Low. Dist. (*Dr. McRee*.)

GENTIANACEÆ.

Sabbatia lanceolata, Tor. & Gr.—Low. and Mid. Dist.
paniculata, Pursh.—Low. Dist.
angularis, Pursh. (Centaury.)—Low. and Mid. Dist.
brachiata, Ell.—Low. Dist.
gracilis, Pursh.—Low. and Mid. Dist.
stellaris, Pursh.—Salt Marshes.
calycosa, Pursh.—Low. Dist.
chloroides, Pursh.—Do.
gentianoides, Ell.—Do.

GENTIANA *quinqueflora*, Lam. (Five flowered Gentian.)—Mecklenburg and westward.
crinita, Frœl. (Fringed Gentian.)—Macon Co.
ochroleuca, Frœl. (Sampson Snake Root.)—Mid. Dist.
Elliottii, Chapm. (Sampson Snake Root.)—Low. Dist.
saponaria, L. (Sampson Snake Root.)—Common.
Andrewsii, Griseb. (Sampson Snake Root.)—Mountains.
angustifolia, Michx. (Narrow-leaved Gentian.)—Low. Dist.

BARTONIA *tenella*, Muhl.—All the Districts.
verna, Muhl.—Low. Dist.

OBOLARIA *Virginica*, L.—Low. and Mid. Dist.

FRASERA *Carolinensis*, Walt. (Columbo.)—Vallies of Macon and Cherokee.

LIMNANTHEMUM *lacunosum*, Griseb. (Floating Heart.)—Low. Dist.
trachyspermum, Gray.—Low. Dist.

APOCYNACEÆ

APOCYNUM *cannabinum*, L. (Indian Hemp.)—Low. Dist. to Mts.
androsæmifolium, L. (Dogbane.)—Mid. Dist.

FORSTERONIA *difformis*, A. D. C.—Low. Dist. to Wake Co.

AMSONIA *ciliata*, Walt.—Robeson and Moore Counties.

Taberna-montana, Walt.—Low. and Mid. Dist.

ASCLEPIADACEÆ

ASCLEPIAS *Cornuti*, Dec. (Milkweed. Silkweed.)—Low. Dist.
(Croom.) Rare.

phytolaccoides, Pursh. (Poke Milkweed. Squaw Root.)—Mountains.

purpurascens, L. (Purple Milkweed.)—Mid. Dist.

variegata, L.—Low. and Mid. Dist.

incarnata, L. (Swamp Silkweed.)—Common.

tomentosa, Ell.—Cumberland County.

paupercula, Michx.—Low. Dist.

rubra, L.—Low. Dist. to Wake.

obtusifolia, Michx.—Low. and Mid. Dist.

amplexicaulis, Michx. (Rabbit's Milk.)—Low. Dist.

quadrifolia, Jacq.—Up. Dist.

verticillata, L.—Low. and Mid. Dist.

tuberosa, L. (Butterfly Weed. Pleurisy Root.)—Common.

ACERATES viridiflora, Ell. (Green Milkweed.)—Mid. Dist.

longifolia, Ell.—Low. Dist.

PODOSTIGMA pubescens, Ell.—Low. Dist.

SEUTERA maritima, Dec.—Salt Marshes.

GONOLOBUS hirsutus, Michx. (Running Milkweed.)—Low. and Mid. Dist.

macrophyllus, Michx.—Low. and Mid. Dist.

OLEACEÆ.

OLEA Americana, L. (Devil Wood.)—Near the coast.

LIGUSTRUM vulgare, L. (Privet.)—About dwellings.

CHIONANTHUS Virginica, L. (Fringe Tree. Old Man's Beard.)—Coast to Blue Ridge.

FRAXINUS platycarpa, Michx. (Water Ash.)—Low. Dist.

Americana, L. (White Ash.)—Mid. and Up. Dist.

pubescens, Lam. (Red Ash.)—Mid. Dist.

viridis, Michx. (Green Ash.)—Mid. and Up. Dist.

ARISTOLOCHIACEÆ.

ARISTOLOCHIA Serpentaria, L. (Virginia Snake-root.)—Common.

tomentosa, Sims.—Mountains.

Sipho, L'Her. (Wild Ginger. Big Sarsaparilla.)—Along mountain rivulets.

ASARUM Canadense, L.—Mountains.

Virginicum, L. (Heart Leaf.)—Mid. and Up. Dist.

arifolium, Michx. (Heart Leaf. Asarabacca.)—Common.

PHYTOLACCACEÆ.

PHYTOLACCA decandra, L. (Poke-weed.)—Common.

CHENOPODIACEÆ.

CHENOPODIUM album, L. (Lamb's Quarters.)—Common about settlements.

murale, L.—Low. and Mid. Dist.

Anthelminticum, L. (Worm-seed. Jerusalem Oak.)—Common.

ATRIPLEX hastata, L. (Orache.)—Sea-shore.

OBIONE arenaria, Moq. (Sand Orache.)—Sea-beach.

CHENOPODINA maritima, Moq. (Sea Goosefoot.)—Salt Marshes.

SALICORNIA herbacea, L. (Samphire.)—Salt Marshes.

ambigua, Michx.—Do.

SALSOLA Kali, L. (Salt-wort.)—Sandy Sea-shore.

AMARANTACEÆ.

- AMARANTUS *albus*, L. (Amaranth.)—Low. Dist.
paniculatus, (Red Amaranth.)—Low. and Mid. Dist.
hybridus, L. (Green Amaranth. Careless.)—Common.
spinosus, L. (Thorny Amaranth.)—Low. and Mid. Dist.
chlorostachys, Willd.—Cultivated grounds.
EUXOLUS *pumilus*, Raf. (Dwarf Amaranth.)—Sandy Sea-shore.
ACNIDA *cannabina*, L. (Water Hemp.)—Low. Dist.
TELANTHERA *polygonoides*, Moq.—Low. Dist.

POLYGONACEÆ.

- POLYGONUM *orientale*, L. (Prince's Feather.)—About settlements.
Pennsylvanicum, L.—Low. and Mid. Dist.
Persicaria, L. (Lady's Thumb.)—Common.
acre, Kth. (Smart Weed.)—Common.
hydropiperoides, Michx. (Water Pepper.)—Common.
hirsutum, Walt.—Low. Dist.
aviculare, L. (Knot Grass.)—Very Common.
“ *erectum*,—Mid. and Up. Dist.
“ *littorale*,—Sea-beach.
tenue, Michx.—Lincoln and westward.
Virginianum, L.—Common.
arifolium, L. (Scratch Grass.)—Common.
sagittatum, L. (Tear Thumb.)—Do.
cilinode, Michx.—Summit of Black Mountain.
dumetorum, L. (False Buckwheat.)—Common.
FAGOPYRUM *esculentum*, Munch. (Buckwheat.)—Occasionally naturalized.
POLYGONELLA *parvifolia*, Michx.—Low. Dist.
articulata, Meisn.—Do.
RUMEX *crispus*, L. (Sour Dock.)—Very common.
verticillatus, L. (Swamp Dock.)—Low. Dist.
sanguineus, L. (Bloody Dock.)—Do. (*Croom*.)
obtusifolius, L. (Bitter Dock.)—All the Districts.
maritimus, L. (Golden Dock.)—Low. Dist. Rare.
Acerosella, L. (Sorrel.)—Common.

LAURACEÆ.

- PERSEA *Carolinensis*, Nees. (Red Bay.)—Low. Dist.
“ *var: palustris*,—Do.

SASSAFRAS officinale, Nees. (Sassafras.)—Common.

BENZOIN odoriferum, Nees. (Spice Bush. Fever Bush.)—Common.
melissæfolium, Nees.—Low. Dist. (*Dr. McRee*.) Mid.
 Dist. (*Prof. Mitchell*.)

TETRANTHERA geniculata, Nees. (Pond Bush.)—Low. Dist. to
 Chatham county.

THYMELEACEÆ.

DIRCA palustris, L. (Leather-wood.)—Mid. and Up. Dist. Rare.

SANTALACEÆ.

COMANDRA umbellata, Nutt. (Toad Flax.)—Mid. Dist.

DARBYA umbellulata, Gray.—Lincoln County.

BUCKLEYA distichophylla, Torr.—French Broad and Pigeon Rivers.
 (*Buckley. Nuttall*.)

PYRULARIA oleifera, Gray. (Oil-nut. Buffalo-nut.)—Mountain sides.

LORANTHACEÆ.

PHORADENDRON flavescens, Nutt. (Mistletoe.)—Common.

SAURURACEÆ.

SAURURUS cernuus, L. (Swamp Lilly. Lizard's Tail.)—Common.

CERATOPHYLLACEÆ.

CERATOPHYLLUM demersum, L.—Low. Dist.

CALLITRICHACEÆ.

CALLITRICHE verna, L. (Water Star-wort.)—Low. and Mid. Dist.

PODOSTEMACEÆ.

PODOSTEMUM ceratophyllum, Michx. (River Weed.)—Streams of
 Mid. and Up. Dist.

EUPHORBACEÆ.

EUPHORBIA corollata, L. (Flowering Spurge.)—Common.

“ var: *angustifolia*.—Low. Dist.

Curtisii, Engelm.—Low. Dist.

atrorubens, Engelm.—Cumberland Co. and southward.

obtusata, Pursh. (Warted Spurge.)—Low. Dist.

Darlingtonii, Gray.—Yancey and Haywood Counties.

Ipecacuanhæ, L. (Wild Ipecac.)—Low. Dist.

cyathophora, Jacq.—Low. Dist.

hypericifolia, L.—Common in waste grounds.

pubentissima, Michx.—Low. Dist.

- EUPHORBIA maculata*, L. (Spotted Spurge.)—Common in waste grounds.
cordifolia, Ell.—Low. Dist.
polygonifolia, L. (Shore Spurge.)—Sea-shore.
Lathyris, L. (Caper Spurge. Mole Plant.)—Up. Dist.
marginata, Pursh. (variegated Spurge.)—Mid. Dist.
- STILLINGIA sylvatica*, L. (Queen's Delight.)—Low. Dist.
ligustrina, Michx.—Low. Dist. (*Dr. McRee*.)
- ACALYPHA Virginica*, L. (Three seeded Merenry.)—Common.
gracilens, Gray.—Low. Dist.
- TRAGIA urticifolia*, Michx.—Mid. Dist.
urens, L. (Nettle.)—Low. Dist.
- CROTON maritimum*, Walt.—Sea coast.
glandulosum, L.—Low. & Mid. Dist.
monanthogynum, Michx.—Surry & westward.
- CROTONOPSIS linearis*, Michx.—Lincoln, Co.
- CNIDOSCOLUS stimulosus*, Gray. (Tread softly.)—Low. & Mid. Dist.
- RICINUS communis*, L. (Castor-oil Plant.)—Near dwellings
- PHYLLANTHUS Caroliniensis*, Walt.—Mid. Dist.

URTICACEÆ.

- URTICA gracilis*, Ait. (Tall Nettle.)—Up. Dist.
capitata, Willd.—Low. to Up. Dist.
urens, L. (Stinging Nettle.)—Low. Dist.
- LAPORTEA Canadensis*, Gaud. (Wood Nettle.)—Up. Dist.
- PILEA pumila*, Gray. (Clear-weed.)—All the Districts.
- PARIETARIA Pennsylvanica*, Muhl. (Pellitory.)—Up. Dist.
debilis, Forst.—Low. Dist.
- BEHMERIA cylindrica*, Willd. (False Nettle.)—Common.

CANNABINACEÆ.

- CANNABIS sativa*, L. (Hemp.)—About settlements.
- HUMULUS Lupulus*, L. (Hop.)—Rockingham to Cherokee.

MORACEÆ.

- MORUS rubra*, L. (Mulberry.)—Common.
alba, L. (White Mulberry.)—About Dwellings.
- BROUSSONETIA papyrifera*, Vent. (Otaheite Mulberry.)—Do.

ULMACEÆ.

- ULMUS Americana*, L. (Elm.)—All the Districts.

ULMUS fulva, Michx. (Slippery Elm.)—All the Districts.

alata, Michx. (Small-leaved Elm.)—Do.

PLANERA aquatica, Gmel. (Planer-Tree.)—South of Cape Fear River.

CELTIS occidentalis, L. (Hackberry.)—All the Districts.

“ var: *pumila*, (Dwarf Hackberry.)—Low. & Mid. Dist.

PLATANACEÆ.

PLATANUS occidentalis, L. (Sycamore.)—Common.

JUGLANDACEÆ.

JUGLANS nigra, L. (Black Walnut.)—Common.

cinerea, L. (White Walnut.)—Guilford & westward.

CARYA alba, Nutt. (Shell-bark Hickory.)—Low. to Up. Dist.

sulcata, Nutt. (Thick Shell-bark H.)—W. part of the State.

tomentosa, Nutt. (White Hickory.)—Common.

glabra, Torr. (Pig-nut Hickory.)—All the Districts.

microcarpa, Nutt. (Small-nut H.)—Western Counties.

amara, Nutt. (Bitter-nut Hickory.)—Coast to the mountains.

aquatica, Nutt. (Water Bitter-nut H.)—Low. Dist.

CUPULIFERÆ.

QUERCUS alba, L. (White Oak.)—Common

obtusiloba, Michx. (Post Oak.)—Do.

lyrata, Walt. (Over-cup Oak.)—Low. Dist. to Chatham & Orange.

Prinus, L. (Swamp Chestnut Oak.)—Low. Dist.

“ var: *discolor*, Michx. (Swamp White Oak.)—Mid. Dist.

“ var: *monticola*, Michx. (Rock Chestnut Oak.)—Mid. & Up. Dist.

castanea, Willd. (Chestnut Oak.)—Low. & other (?) Districts.

prinoides, Willd. (Chinquapin Oak.)—All the Districts.

virens, Ait. (Live Oak.)—Sea-coast.

Phellos, L. (Willow Oak.)—Low. & Mid. Dist.

“ var: *heterophylla*.—Alamance Creek.

laurifolia, Michx. (Laurel Oak.)—Do.

imbricaria, Michx. (Shingle Oak.)—Mountain streams.

“ var: *Leana*.—Pigeon River.

cinerea, Michx. (Upland Willow Oak.)—Low. Dist.

- QUERCUS cinerea* var: *pumila*, (Running Oak.)—Do.
aquatica, Cates. (Water Oak.)—Coast to the mountains.
nigra, L. (Black Jack.)—Do.
falcata, Michx. (Spanish Oak.)—Common.
 “ var: *pagodæfolia*.—Low. Dist.
 “ *triloba*.—Do.
tinctoria, Bartr. (Black Oak.)—Low. ? and other Districts.
coccinea, Wang. (Scarlet Oak.)—All the Districts.
rubra, L. (Red Oak.)—Do.
Catesbæi, Michx. (Scrub Oak.)—Low. Dist.
ilicifolia, Wang. (Bear Oak.)—Mountains. Rare.
CASTANEA vesca, L. (Chestnut.)—Guilford and westward.
 . *pumila*, Michx. (Chinquapin.)—Coast to Cherokee.
 “ var: *nana*.—Low. Dist. to Wake.
FAGUS ferruginea, Ait. (Beech.)—All the Districts.
CORYLUS Americana, Walt. (Hazel-nut.)—Mountains.
 . *rostrata*, Ait. (Beaked Hazel-nut.)—Mid. and Up. Dist.
CARPINUS Americana, Michx. (Hornbeam.)—Common along streams.
OSTRYA Virginica, Willd. (Hop Hornbeam.)—Mid. and Up. Dist.

MYRICACEÆ.

- MYRICA cerifera*, L. (Wax Myrtle. Bayberry.)—Swamps of Low. Dist.
 . “ var: *pumila*.—Barrens of Low. Dist.
COMPTONIA asplenifolia, Ait. (Sweet Fern.)—Franklin, Wake and Cumberland to the mountains.

BETULACEÆ.

- BETULA nigra*, L. (Red Birch.)—Common on rivers.
excelsa, Ait. (Yellow Birch.)—Black Mountain. Also mountains of Haywood. (*Buckley*.)
lenta, L. (Black Birch.)—Mountains.
ALNUS serrulata, Ait. (Alder.)—Common.
viridis, D. C. (Mountain Alder.)—Top of Roan Mountain.

SALICACEÆ.

- SALIX nigra*, Marsh. (Black or Swamp Willow.)—Common on streams.
tristis, Ait. (Gray Willow.)—Mountains.
humilis, Marsh. (Bush Willow.)—All the Districts.

sericea, Marsh. (Silky-leaved Willow.)—Low. Dist. ?

Babylonica, Tourn. (Weeping Willow.)—About dwellings.

vitellina, Smith. (Yellow Willow.)—Do.

POPULUS *angulata*, Ait. (Carolina Poplar.)—Low. and Mid. Dist.

heterophylla, L. (Cotton Tree.)—Low. Dist.

grandidentata, Michx. (Large-toothed Aspen.)—Mid. Dist.

dilatata, Ait. (Lombardy Poplar.)—About settlements.

CONIFERÆ.

PINUS *mitis*, Michx. (Yellow or short-leaved Pine.)—Common.

inops, Ait. (Cedar or Scrub Pine.)—Mid. and Up. Dist.

pungens, Michx. (Prickly Pine.)—Pilot Mountain to Blue Ridge.

rigida, Mill. (Pitch Pine.)—Mid. and Up. Dist. Rare.

serotina, Michx. (Pond Pine.)—Low. and Mid. Dist.

Taeda, L. (Oldfield, Loblolly, Slash Pine.)—Low. and Mid. Dist.

australis, Michx. (Long-leaf Pine.)—Low. Dist. Rare in the Middle.

Strobus, L. (White Pine.)—Mountains.

ABIES *Fraseri*, Pursh. (Balsam Fir.)—Highest mountains.

nigra, Poir. (Black Spruce.)—Do.

alba, Michx? (White Spruce.)—Do.

Canadensis, Michx. (Hemlock. Spruce Pine.)—Mountains.

CUPRESSUS *thyoides*, L. (White Cedar. Juniper.)—Low. Dist.

TAXODIUM *distichum*, Rich. (Cypress.)—Do.

“ *var: imbricaria*, Nutt.—Do.

THUJA *occidentalis*, L. (Arbor Vitæ.)—Mountains. Rare.

JUNIPERUS *Virginiana*, L. (Red Cedar.)—Common.

CLASS II. ENDOGENOUS PLANTS.

PALMACEÆ.

- SABAL Palmetto, R. & S. (Palmetto).—Cape Fear & southward.
 Adansonii, Guerns. (Dwarf Palmetto).—Low. Dist.

ARACEÆ.

- ARISÆMA triphyllum, Torr. (Indian Turnip).—Common.
 Dracontium, Schott. (Dragon Root).—Mid. Dist.
 polymorphum, Chapm.—French Broad River. (*Buckley*).
 PELTANDRA Virginica, Raf. (Arrow Arum).—Lincoln Co.
 XANTHOSOMA sagittifolium, Schott. (Spoon Flower).—Wilmington.
 SYMPLOCARPUS foetidus, Salisb. (Skunk Cabbage).—Near Raleigh.
 ORONTIUM aquaticum, L. (Golden Club. Water Dock).—Coast to
 Cherokee.
 ACORUS Calamus, L. (Calamus).—All the Districts.

LEMNACEÆ.

- LEMNA minor, L. (Duck-weed).—Low. & Mid. Dist.
 polyrhiza, L.—Low. Dist.

TYPHACEÆ.

- TYPHA latifolia, L. (Cat-tail).—Common.
 SPARGANIUM ramosum, Huds. (Bur Reed).—Low. & Mid. Dist.

NAIADACEÆ.

- NAIAS flexilis, Rotsk.—Low. Dist.
 ZOSTERA marina, L. (Sea-wrack).—Salt water.
 ZANNICHELLIA palustris, L.—Low. Dist.
 RUPPIA maritima, L. (Ditch Grass).—Low. Dist.
 POTAMOGETON pectinatus, L. (Pond-weed).—Low. Dist.
 pauciflorus, Pursh.—Low. & Mid. Dist.
 perfoliatus, L.—Low. Dist.
 lucens, L.—Low. & Mid. Dist.
 fluitans, Roth.—Low. & Mid. Dist.
 heterophyllus, Schreb.—Low. & Mid. Dist.
 hybridus, Michx.—Do.

ALISMACEÆ.

- ALISMA Plantago, L. (Water Plantain).—Common.

TRIGLOCHIN triandrum, Michx. (Arrow Grass.)—Low. Dist.

ECHINODORUS radicans, Engelm.—Low. Dist.

SAGITTARIA variabilis, Engelm. (Arrow-leaf.)—Common.

falcata, Pursh.—Low. Dist.

heterophylla, Pursh.—Low. Dist.

simplex, Pursh.—Do.

natans, Michx.—Do.

pusilla, Nutt.—Do.

HYDROCHARIDACEÆ.

ANACHARIS Canadensis, Planch. (Water-weed.)—Valley River, Cherokee.

VALLISNERIA spiralis, L. (Tape Grass.)—Near Newbern. (*Croom.*)

LIMNOBIUM Spongia, Rich. (Frog-bit.)—Low. Dist.

BURMANNIACEÆ.

BURMANNIA biflora, L.—Low. Dist.

capitata, Chapm.—Do.

ORCHIDACEÆ.

MICROSTYLIS ophioglossoides, Nutt. (Adder's Mouth.)—All the Districts.

LIPARIS liliifolia, Rich. (Twayblade.)—Low. and Up. Districts.

CORALLORHIZA odontorhiza, Nutt. (Coral Root.)—Mid. and Up. Dist.
innata, R. Br.—Up. Dist.

APLECTRUM hiemale, Nutt. (Putty Root.)—Macon Co. (*Buckley.*)

CALOPOGON pulchellus, R. Br. (Bearded Pink.)—Common.
parviflorus, Lindl.—Low. Dist.

“ *var: albus*.—Do.

TIPULARIA discolor, Nutt. (Crane-Fly Orchis.)—Low. and Mid. Dist.

BLETTIA aphylla, Nutt.—Low. Dist. (*Dr. McRee.*) Mid. Dist. (*Dr. Hunter.*)

POGONIA ophioglossoides, Nutt.—Low. Dist. to Mountains.

pendula, Lindl.—Mid. and Up. Dist.

divaricata, R. Br.—Low. and Up. Dist.

verticillata, Nutt.—Low. Dist. (*Geo. Wilson.*)

ARETHUSA bulbosa, L.—Mountains. (*Michaux.*)

ORCHIS spectabilis, L. (Showy Orchis.)—Davidson county and westward.

- GYMNADENIA flava*, Lindl. Macon and Cherokee.
tridentata, Lindl.—Mountains.
- PLATANATHERA orbiculata*, Lindl. (Round-leaved Orchis.)—Mountains.
flava, Gray. (Yellow Orchis.)—Low. Dist.
bracteata, Tor. (Green Orchis.)—Mountains.
ciliaris, Lindl. (Yellow Fringed-Orchis.)—Common.
blephariglottis, Lindl. (White Fringed-Orchis.)—Low. and Mid. Dist.
cristata, Lindl. (Crested Orchis.)—Coast to Mountains.
lacera, Gray. (Ragged Orchis.)—Up. Dist.
psycodes, Gray. (Small Purple Fringed-Orchis.)—Mid. and Up. Dist.
fimbriata, Lindl. (Large Purple Fringed-Orchis.)—Mountain Swamps.
peranema, Gray. (Great Purple Orchis.)—Mid. and Up. Dist.
- HABENARIA repens*, Nutt.—Low. Dist.
- SPIRANTHES cernua*, Rich. (Lady's Tresses.)—Common.
odorata, Nutt.—Low. Dist.
tortilis, Willd.—Common.
gracilis, Bigel.—Low. Dist.
- GOODYERA pubescens*, R. Br. (Rattlesnake Plantain.)—Lincoln and westward.
repens, R. Br.—Mountains.
- LISTERA australis*, Lindl. (Twayblade.)—Low. Dist.
convallarioides, Hook.—Mountains.
- POSTHIEVA glandulosa*, R. Br.—Low. Dist.
- CYPRIPEDIUM pubescens*, Willd. (Yellow Lady's Slipper.)—Mid. and Up. Dist.
parviflorum, Salisb.—Mountains. (*Michaux.*)
spectabile, Swartz.—Mountains.
acaule, Ait. (Purple Lady's Slipper.)—All the Districts.

AMARYLLIDACEÆ.

- AMARYLLIS Atamaseo*, L. (Atamaseo Lily.)—Low. and Mid. Dist.
PANCRATIUM rotatum, Ker.—Low. and Mid. Dist.
AGAVE Virginica, L. (False Aloe.)—Mid. and Up. Dist.
HYPOXYS erecta, L. (Yellow Star-grass.)—Common.

HEMORRHOIDACEÆ.

- LACHNANTHES tinctoria*, Ell. (Red Root.)—Low. Dist.
LOPHIOLA aurea, Ker.—Low. Dist.
ALETRIS farinosa, L. (Star-grass. Colic-root.)—Common.
 aurea, Walt.—Low. and Mid. Dist.

BROMELIACEÆ.

- TILLANDSIA usneoides*, L. (Long Moss.)—Low. Dist.

IRIDACEÆ.

- IRIS versicolor*, L. (Blue Flag.)—Common.
 tripetala, Walt.—Low. Dist.
 Virginica, L.—All the Districts.
 cristata, Ait. (Crested Iris.)—Mid. and Up. Dist.
 verna, L. (Dwarf Iris.)—Low. and Mid. Dist.
PARDANTHUS Chinensis, Ker. (Blackberry Lily.)—Mid. Dist.
SISYRINCHIUM Bermudiana, L. (Blue-eyed Grass. Pepper Grass.)—Common.

DIOSCOREACEÆ.

- DIOSCOREA villosa*, L. (Wild Yam.)—Low. and Mid. Dist.

SMILACEÆ.

- SMILAX rotundifolia*, L. (Bamboo.)—Common.
 tamnioides, L.—Low. and Mid. Dist.
 Pseudo-China, L. (China Root.)—Common.
 glauca, Walt. (Sarsaparilla.)—Do.
 Walteri, Pursh. (Red-berried Bamboo.)—Low. Dist.
 lanceolata, L.—Low. Dist.
 laurifolia, L.—Do.
 auriculata, Walt.—On the Coast.
COPROSMAANTHUS herbaceus, Kth. (Carrion Flower.)—Mid. Dist.
 peduncularis, Kth.—Low. and Mid. Dist.
 tamniifolius, Kth.—Do.
TRILLIUM sessile, L. (Wake Robin.)—Davidson and westward.
 cernuum, L.—Mid. and Up. Dist.
 stylosum, Nutt.—Mid. Dist.
 erythrocarpum, Michx. (Wild Pepper.)—Mountains.
 grandiflorum, Salisb.—Mountains.
 erectum, L.—Mountains.
 pusillum, Michx.—Low. Dist.
MEDEOLA Virginica, L. (Cucumber Root.)—Lincoln and westward.

LILIACEÆ.

- LILIUM* *superbum*, L. (Turk's-cap Lily.)—Mountains.
 " *var:* *Carolinianum*.—Mid. and Up. Dist.
Canadense, L. (Yellow Lily.)—Mountains.
Philadelphicum, L. (Orange Lily.)—Do.
Catesbæi, Walt. (Southern Lily.)—Low. Dist. to Wake Co.
YUCCA *aloifolia*, L. (Spanish Bayonet.)—Low. Dist.
 gloriosa, L.—Sea-coast.
 filamentosa, L. (Bear Grass.)—All the Districts.
 recurvifolia, Salisb.—"Sandy fields, N. Car." (*Nuttall*.)
ERYTHRONIUM *Americanum*, Smith. (Yellow Adder's Tongue.)—
 Mid. and Up. Dist.
POLYGONATUM *biflorum*, Ell. (Solomon's Seal.)—Common.
SMILACINA *racemosa*, Desf. (False Spikenard.)—Mid. and Up. Dist.
 bifolia, Ker.—Mid. and Up. Dist.
CONVALLARIA *majalis*, L. (Lily of the Valley.)—Mountains.
CLINTONIA *umbellata*, Torr.—Mountains.
 borealis, Raf.—Do.
ALLIUM *tricoceum*, Ait. (Ramps.)—Mountains.
 cernuum, Roth.—Do.
 Canadense, Kahn.—Low. and Mid. Dist.
 striatum, Jacq.—Low. Dist. to Wake.
 vineale, L. (Wild Onion.)—Fields in Low. and Mid. Dist.

MELANTHACEÆ.

- MELANTHIUM* *Virginicum*, L. (Bunch Flower.)—All the Districts.
ZYGADENUS *glaberrimus*, Michx.—Low. Dist.
 leimanthoides, Gray.—Mountains.
STENANTHIUM *angustifolium*, Gray.—All the Districts.
VERATRUM *viride*, L. (Big Hellebore. Bear Corn.)—Mountains.
 parviflorum, Michx.—Mountains.
AMIANTHUM *muscatoxicum*, Gray. (Fall Poison. Hellebore. Crow
 Poison.)—Common.
 angustifolium, Gray.—Low. Dist.
XEROPHYLLUM *asphodeloides*, Gray.—Table Mountain.
CHAMÆLIRIUM *luteum*, Gray. (Blazing Star. Devil's bit.)—Common.
PLEEA *tenuifolia*, Michx.—Low. Dist.
TOFIELDIA *glabra*, Nutt. (False Asphodel.)—Low. Dist.
 pubens, Ait.—Common.

TOFIELDIA glutinosa, Willd.—Mountains.

UVULARIA perfoliata, L. (Bell-wort.)—Mid. Dist.

grandiflora, Smith.—Mountains.

sessilifolia, L.—Common.

puberula, Michx.—Mid. and Up. Dist.

PROSARTES lanuginosa, Don.—Mountains.

STREPTOPUS roseus, Michx.—Do.

JUNCACEÆ.

JUNCUS effusus, L. (Bog Rush.)—Common.

setaceus, Rostk.—Low. and Mid. Dist.

maritimus, Lam.—Brackish marshes.

tenuis, Willd.—Common.

Gerardi, Lois.—Brackish marshes.

dichotomus, Ell.—Low. and Mid. Dist.

scirpoides, Lam.—Do.

polycephalus, Ell.—Common.

paradoxus, Meyer.—Low. Dist.

debilis, Gray.—Low. Dist.

acuminatus, Michx.—Do.

Elliottii, Chapm.—Do.

Conradi, Tuck.—Do.

marginatus, Rostk.—Low. and Mid. Dist.

“ var: *cylindricus*.—Lincoln County.

bufonius, L.—Low. Dist.

LUZULA campestris, D. C.—Common.

pilosa, Willd.—Mountains.

CEPHALOXYS flabellata, Desv.—Low. Dist.

PONTEDERIACEÆ.

PONTEDERIA cordata, L. (Pickerel Weed.)—Common.

SCHOLLERA graminea, Willd. (Water Star Grass.)—Surry and westward.

HETERANTHERA reniformis, R. & P. (Mud Plantain.)—N. Carolina.
(*Prof. Darby.*)

COMMELYNACEÆ.

COMMELYN communis, L. (Day Flower.)—Low. Dist.

Virginica, L.—Common.

erecta, L.—Mid. and Up. Dist.

TRADESCANTIA *Virginica*, L. (Spider-wort.)—Mountains.
rosea, Vent.—Low. Dist.

MAYACACEÆ.

MAYACA *Michauxii*, S. & E.—Low. Dist.

XYRIDACEÆ.

XYRIS *brevifolia*, Michx. (Yellow-eyed Grass.)—Low. and Mid. Dist.

ambigua, Beyr.—Low. Dist.

flexuosa, Muhl.—Up. Dist.

Caroliniana, Walt.—Common.

fimbriata, Ell.—Low. Dist.

torta, Smith.—Low. and Mid. Dist.

tenuifolia, Chapm.—Low. Dist.

Baldwiniana, R. & S.—Low. Dist.

ERIOCAULONACEÆ.

ERIOCAULON *decangulare*, L. (Pipe-wort.)—Low. and Mid. Dist.

gnaphalodes, Michx.—Low. Dist.

PEPALANTHUS *flavidulus*, Kth. (Yellow Pipe-wort.)—Low. Dist.

LACHNOCAULON *Michauxii*, Kth. (Hairy Pipe-wort.)—Low. and Mid. Dist.

CYPERACEÆ. (Sedge Grasses.)

CYPERUS *flavescens*, L.—Mid. Dist.

diandrus, Torr.—Common.

Nuttallii, Torr.—Low. Dist.

microdontus, Torr.—Mid. Dist.

Gatesii, Torr.—Low. Dist.

strigosus, L.—Common.

speciosus, Vahl.—Low. Dist.

stenolepis, Torr.—Do.

Michauxianus, Schultes.—Do.

“ var: ? *elongatus*, Torr.—Up. Dist.

tetragonus, Ell.—Low. Dist.

repens, Ell.—Do.

rotundus, L. (Nut Grass.)—Low. and Mid. Dist.

Haspan, L.—Low. and Mid. Dist.

dentatus, Torr.—Low. and Mid. Dist.

virens, Michx.—Low. and Mid. Dist.

vegetus, Willd.—Low. Dist.

- CYPERUS** *inflexus*, Muhl.—Mid. Dist.
compressus, L.—Low. Dist.
filiculmis, Vahl.—Do.
Grayii, Torr.—Do.
ovularis, Torr.—Low. and Mid. Dist.
retrofractus, Torr.—Common.
Baldwinii, Torr.—Low. Dist.
erythrorhizos, Muhl.—Low. and Mid. Dist.
- KYLLINGIA** *pumila*, Michx.—Common.
- LIPOCARPHA** *maculata*, Torr.—Low. and Mid. Dist.
- HEMICARPHA** *subsquarrosa*, Nees.—Mid. Dist.
- DULICHNIUM** *spathaceum*, Rich.—Low. and Mid. Dist.
- FUIRENA** *squarrosa*, Michx. (Umbrella Grass.)—Low. and Mid. Dist.
 “ *var: hispida*.—Mid. Dist.
- ELEOCHARIS** *equisetoides*, Torr. (Spike Rush.)—Low. Dist.
quadrangulata, R. Br.—Do.
tuberculosa, R. Br.—Low. and Mid. Dist.
simplex, Torr.—Do.
prolifera, Torr.—Low. Dist.
intermedia, Torr.—Mid. Dist.
rostellata, Torr.—Low. Dist.
melanocarpa, Torr.—Do.
tricostata, Torr.—Do.
tennis, Schultes.—Mid. Dist.
microcarpa, Torr.—Low. Dist.
olivacea, Torr.—Sea-coast.
palustris, R. Br.—Low. Dist.
obtusata, Schultes.—Common.
acicularis, R. Br.—Low. Dist.
pygmæa, Torr.—Near the Coast.
Baldwinii, Torr.—Do.
- SCIRPUS** *cæspitosus*, L. (Bulrush.)—Mountains.
debilis, Pursh.—All the Districts.
pungens, Vahl. (Sword Grass.)—Near the Coast.
Olneyi, Gray.—Brackish marshes.
lacustris, L.—Low. Dist.
maritimus, L.—Salt Marshes.
polyphyllus, Vahl.—Mid. Dist.
Eriophorum, Michx.—Common.
lineatus, Michx.—Low. Dist.

- ERIOPHORUM** *Virginicum*, L. (Cotton Grass.)—Common.
polystachyon, L.—Mountain swamps.
- FIMBRISTYLIS** *spadicea*, Vahl.—Low. and Mid. Dist.
 “ *var: puberula*.—Low. Dist.
laxa, Vahl.—Mid. and Up. Dist.
- TRICHELOSTYLIS** *autumnalis*, Chapm.—Common.
- ISOLEPIS** *capillaris*, R. & S.—Low. and Mid. Dist.
ciliatifolia, Torr.—Low. Dist.
stenophylla, Torr.—Low. Dist.
- RHYNCHOSPORA** *plumosa*, Ell. (Tick-seed Grass.)—Low. Dist.
oligantha, Gray.—Low. Dist.
rariflora, Ell.—Do.
Torreyana, Gray.—Do.
cymosa, Nutt.—Mid. Dist.
microcarpa, Baldw.—Low. Dist.
inexpansa, Vahl.—Do.
caduca, Ell.—Do.
miliacea, Gray.—Do.
Grayii, Kth.—Do.
megalocarpa, Gray.—Do.
Baldwinii, Gray.—Do.
ciliata, Vahl.—Do.
fascicularis, Nutt.—Do.
 “ *var: distans*.—Do.
filifolia, Gray.—Do.
pallida, M. A. C.—Do.
alba, Vahl.—Low. and Mid. Dist.
gracilentia, Gray.—Do.
glomerata, Vahl.—Common.
 “ *var: paniculata*.—Do.
cephalantha, Gray.—Low. Dist.
Chapmanii, M. A. C.—Do.
- CERATOSCHÆNUS** *macrostachyus*, Gray. (Horned Rush.)—Low. Dist.
corniculatus, Nees.—Low. Dist.
- PSILOCARYA** *rhynchosporoides*, Torr. (Bald Rush.)—Low. Dist.
- CLADIUM** *effusum*, Torr. (Saw Grass.)—Low. Dist.
mariscoides, Torr. (Twig Rush.)—Do.
- DICHROMENA** *latifolia*, Baldw.—Low. Dist.
leucocephala, Michx.—Do.

SCLERIA *triglomerata*, Michx. (Nut Rush.)—Common.
reticularis, Michx.—Low. Dist.
laxa, Torr.—Common.
Elliottii, Chapm.—Low. and Mid. Dist.
pauciflora, Muhl.—Mid. Dist.
gracilis, Ell.—Low. Dist.
verticillata, Muhl.—Do.

CAREX *bromoides*, Schk. (Sedge Grass.)—Low. Dist.
decomposita, Muhl.—Mid. Dist. ?
vulpinoidea, Michx.—Low. and Mid. Dist.
stipata, Muhl.—Do.
sparganioides, Muhl.—Mid. Dist.
Muhlenbergii, Schk.—Low. and Mid. Dist.
cephalophora, Muhl.—Mid. Dist.
rosea, Schk.—Do.
retroflexa, Muhl.—Mountains.
stellulata, Good.—Common.
canescens, L.—Mountains. (*Buckley*.)
scoparia, Schk.—Common.
“ var: *lagopodioides*.—Do.
straminea, Schk.—Do.

“ var: *festucea*.—Up. Dist.
fœnea, Muhl.—Low. Dist.

“ var: *alata*.—Do. (*Croom*.)
torta, Boott.—Macon County.
stricta, Good.—Common.
erinita, Lam.—Common.

“ var: *gynandra*.—Low. Dist.
Mitchelliana, M. A. C.—Chatham County.
polytrichoides, Muhl.—Common.
Fraseri, Sims.—High mountains.
Willdenovii, Schk.—Up. Dist.
squarrosa, L.—Mid. Dist.
Buxbaumii, Wahl.—Mountains. (*Prof. Gray*.)
hirsuta, Willd.—Common.
triceps, Michx.—Mid. Dist.
virescens, Muhl.—Mountains.
æstivalis, M. A. C. (Winter Grass.)—Mountains.
gracillima, Schwein.—Low. Dist.
Davisii, Schw. & Torr.—Mountains.

- CAREX miliacea, Muhl.—Lincoln to Cherokee.
 filiformis, L.—Mountain swamps.
 vestita, Willd.—Up. Dist.
 polymorpha, Muhl.—Swamps of Low. and Up. Dist.
 dasycarpa, Muhl.—Low. Dist.
 Pennsylvanica, Lam.—Common.
 “ var: Muhlenbergii.—Up. Dist.
 lucorum, Willd.
 “ var: nigromarginata.—Mid. Dist.
 “ var: Emmonsii.—Low. and Mid. Dist.
 grisea, Wahl.—Mid. Dist.
 “ var: mutica.—Low. Dist.
 granularis, Muhl.—Low. Dist.
 conoidea, Schk.—Common.
 tetanica, Schk.—Mountains.
 laxiflora, Lam.—Common.
 “ var: striatula.—Mid. and Up. Dist.
 styloflexa, Buckl.—Mid. and Up. Dist.
 digitalis, Willd.—Do.
 oligocarpa, Schk.—Common.
 plantaginea, Lam.—Mountains. (*Prof. Gray.*)
 Caroliniana, Buckl.—Mountains.
 venusta, Dew.—Low. Dist.
 debilis, Michx.—Common.
 juncea, Willd.—Roan Mountain. (*Buckley.*)
 scabrata, Schwein.—Mountains.
 flacca, Schreb.—Mid. Dist.
 glaucescens, Ell.—Low. Dist.
 verrucosa, Ell.—Do.
 comosa, Boott.—Do.
 hystericina, Muhl.—Mountains.
 tentaculata, Muhl.—Common.
 gigantea, Rudge.—Up. Dist.
 lupulina, Muhl.—Common.
 subulata, Michx.—Low. Dist.
 folliculata, L.—Common.
 turgescens, Torr.—Low. Dist.
 Elliottii, Schw. & Tor.—Do.
 intumescens, Rudge.—Up. Dist.
 striata, Michx.—Low. Dist.?

- CAREX riparia*, Curt.—Low Dist.
bullata, Schk.—Mid. Dist. ?
- GRAMINEÆ. (Grasses.)
- LEERSIA oryzoides*, Swartz. (Rice Grass.)—Common.
Virginica, Willd.—Common.
lenticularis, Michx.—Islands of the Roanoke. (*Pursh.*)
- ZIZANIA aquatica*, L. (Wild Rice.)—Low. Dist.
miliacea, Michx. (Wild Oats.)—Low. and Mid. Dist.
- HYDROCHLOA Carolinensis*, Beauv.—Low. Dist.
- ALOPECURUS geniculatus*, L. (Floating Foxtail.)—Swampy Grounds.
pratensis, L. (Meadow Foxtail.)—Meadows.
- PHLEUM pratense*, L. (Timothy.)—Meadows.
- POLYPOGON maritimus*, Willd. (Beard Grass.)—Sea-coast.
- SPOROBOLUS junceus*, Kth. (Wire Grass.)—Low. and Mid. Dist.
Indicus, Br.—Do.
Virginicus, Kth.—Mid. Dist.
- VILFA aspera*, Beauv.—Low. and Mid. Dist.
vaginæflora, Torr.—Mid. Dist.
- AGROSTIS elata*, Trin. (Tall Thin Grass.)—Common.
perennans, Gray. (Thin Grass.)—Common.
scabra, Willd. (Hair Grass.)—Do.
alba, L. (Bent Grass. Herd's Grass.)—Common.
rupestris, All.—Mountains.
- CINNA arundinacea*, L. (Wood Reed Grass.)—Common.
 “ *var: pendula*.—Mountains.
- MUHLENBERGIA Mexicana*, Trin. (Drop-seed Grass.)—Mid. and Up. Dist.
Willdenovii, Trin.—Mountains.
diffusa, Schreb. (Nimble Will.)—Common.
capillaris, Kth. (Hair Grass.)—Near the coast.
trichopodes, Chapm.—Low. and Mid. Dist.
- BRACHYELYTRUM aristatum*, Beauv.—Mountains.
- CALAMAGROSTIS coarctata*, Torr. (Reed Bent Grass. Wild Oats.)—Common.
arenaria, Roth.—Sea-beach.
- STIPA avenacea*, L. (Feather Grass.)—Low. and Mid. Dist.
- ARISTIDA lanata*, Poir. (Three-awned Grass.)—Low. and Mid. Dist.
purpurascens, Poir.—Common.
gracilis, Ell.—Do.

- ARISTIDA** *virgata*, Trin.—Low. Dist.
stricta, Michx. (Wire Grass.)—Low. Dist.
dichotoma, Michx. (Poverty Grass.)—Mid. Dist.
spiciformis, Ell.—Low. Dist.
oligantha, Michx.—Do.
- SPARTINA** *juncea*, Willd.—Sea coast.
polystachya, Willd.—Low. Dist.
glabra, Muhl. (Marsh Grass.)—Salt Marshes.
- GYMNOPOGON** *racemosus*, Beauv.—Common.
 “ *var: filiformis*.—Low. and Mid. Dist.
- EUSTACHYS** *petræa*, Desv.—Sea coast.
- CYNODON** *Dactylon*, Pers. (Bermuda Grass. Reed Grass.)—Low. and Mid. Dist.
- CTENIUM** *Americanum*, Spreng. (Lemon Grass.)—Low. Dist. to Wake Co.
- DACTYLOCTENIUM** *Aegyptiacum*, Willd. (Egyptian Grass.)—Do.
- ELEUSINE** *Indica*, Gaert. (Goose Grass.)—Common.
- LEPTOCHLOA** *micronata*, Kth.—Common in cult. grounds.
polystachya, Kth.—Brackish marshes.
- TRICUSPIS** *seslerioides*, Torr.—Common in old fields.
- TRIPLASIS** *Americana*, Beauv. (Sand Grass.)—Low. Dist.
purpurea, Chapm.—Low. Dist.
- EATONIA** *obtusata*, Gray.—Common.
Pennsylvanica, Gray.—Mid. and Up. Dist.
- MELICA** *mutica*, Walt. (Melic Grass.)—Common.
- GLYCERIA** *nervata*, Trin.—All the Districts.
pallida, Trin.—Up. Dist. (*Dr. Hunter.*)
fluitans, R. Br.—Low. and Up. Dist.
- ARUNDINARIA** *gigantea*, Chapm. (Cane.)—Low. Dist.
tecta, Muhl. (Reed.)—Common.
- BRIZOPYRUM** *spicatum*, Hook. (Spike Grass.)—Sea coast.
- POA** *annua*, L. (Spear Grass. May Grass.)—Common.
flexuosa, Muhl.—Common.
pratensis, L. (Blue Grass.)—Common.
compressa, L.—All the Districts.
- DACTYLIS** *glomerata*, L. (Orchard Grass.)—All the Districts.
- ERAGROSTIS** *reptans*, Nees.—Mid. and Up. Dist.
megastachya, Link.—Common.
Purshii, Schrad.—Do.

- ERAGINOSTIS tenuis, Gray.—Do.
 capillaris, Nees.—Mid. Dist.
 pectinacea, Gray.—Common.
 “ var: refracta.—Low. and Mid. Dist.
- FESTUCA Myurus, L. (Fescue Grass.)—Low. and Mid. Dist.
 tenella, Willd.—Do.
 duriuscula, L.—Sea coast.
 elatioꝛ, L.—Low. and Mid. Dist.
 nutans, Willd.—Common.
- BROMUS secalinus, L. (Cheat. Chess.)—Wheat fields.
 ciliatus, L.—Mid. and Up. Dist.
 “ var: purgans.—Do.
- UNIOLA latifolia, Michx.—Mid. and Up. Dist.
 paniculata, L. (Beach Grass.)—Sea-beach.
 gracilis, Michx.—Common.
- HORDEUM pusillum, Nutt.—Low. Dist. (W. M. Canby.)
- ELYMUS Virginicus, L. (Rye Grass.)—Common.
 striatus, Willd.—Mountains.
- GYMNOSTICHUM Hystrix, Schreb. (Bottle Brush.)—Mid. and Up. Dist.
- LOLIUM temulentum, L. (Darnel.)—Mid. Dist.
- AIRA flexuosa, L. (Hair Grass.)—Mountains.
- TRisetum palustre, Torr.—Low. and Mid. Dist.
 molle, Kth.—Roan Mountain.
- DANTHONIA spicata, Beauv. (Wild Oat Grass.)—Common.
 sericea, Nutt.—Low. and Mid. Dist.
- ARRHENATHERUM avenaceum, Beauv. (Tall Oat Grass.)—Mid. Dist.
 in meadows.
- HOLCUS lanatus, L. (Velvet Grass.)—Common. In meadows.
- ANTHOXANTHUM odoratum, L. (Sweet-scented Grass.)—Do.
- PHALARIS intermedia, Bosc. (Southern Canary Grass.)—Low. Dist.
- PASPALUM fluitans, Kth.—Lincoln Co. Also Gaston Co.? (Dr. Hunter.)
 Walteri, Schultes.—Low. Dist.
 Digitaria, Poir.—Do.
 distichum, L. (Joint Grass.)—Low. and Mid. Dist.
 præcox, Walt.—Low. Dist. to Wake.
 læve, Michx.—Common.
 Floridanum, Michx.—Low. and Mid. Dist.
 racemulosum, Nutt.—Coast to Cherokee.

PASPALUM undulatum, Poir.—Low. and Mid. Dist.

ciliatifolium, Michx.—Common.

AMPHICARPUM Purshii, Kth.—Near Newbern. (*Croom*.)

PANICUM sanguinale, L. (Crab Grass.)—Common.

filiforme, L.—Common.

gibbum, Ell.—Low. Dist.

Curtisii, Chapm.—Do.

hians, Ell.—Low. and Mid. Dist.

anceps, L.—Common.

virgatum, L.—Do.

amarum, Ell.—On the coast.

proliferum, Lam.—Common.

capillare, L.—Do.

divergens, Muhl.—Low. Dist.

verrucosum, Muhl.—Common.

latifolium, L.—Mid. and Up. Dist.

clandestinum, L.—Mid. Dist.

scoparium, L.—Common.

pauciflorum, Ell?—Low. Dist.

viscidum, Ell.—Low. Dist.

scabriusculum, Ell.—Do.

microcarpon, Muhl.—Mid. Dist.

dichotomum, L.—Common.

commutatum, Schultes.—Low. and Mid. Dist.

depauperatum, Muhl.—Do.

ignoratium, Kth.—Low. Dist.

rufum, Kth.—Do.

Crus-Galli, L.—Common.

“ var : *hispidum*.—Do.

Walteri, Ell.—Low. and Mid. Dist.

hirtellum, L.—Near the coast.

SETARIA verticillata, Beauv.—Low. Dist.

glauca, Beauv. (Foxtail.)—Common.

Italica, Kth. (Italian Millet.)—Near Wilmington.

CENCHRUS tribuloides, L. (Sand-spur.)—On the coast.

ROTTBELLIA rugosa, Nutt.—Near Newbern. (*Croom & Wilson*.)

TRIPSACUM dactyloides, L. (Gama Grass.)—Low. and Mid. Dist.

ANDROPOGON scoparius, Michx. (Broom Grass.)—Low. and Mid. Dist.

- ANDROPOGON furcatus, Muhl.—Common.
tetrastachyus, Ell.—Common.
“ var: distachyus.—Low. Dist.
Elliottii, Chapm.—Low. Dist.
Virginicus, L.—Do.
“ var: vaginatus.—Low. Dist. to Wake Co.
macrourus, Michx.—Low. and Mid. Dist.
ternarius, Michx.—Mountains. (*Michaux.*)
- ERIANTHUS alopecuroides, Ell.—Coast to Cherokee.
brevibarbis, Michx.—Mid. Dist.
- SORGHUM avenaceum, Chapm. (Indian Grass.)—Common.
Halapense, Pers. (Cuba Grass.)—Low. and Mid. Dist.
nutans, Gray. (Wood Grass.)—Common.

FLOWERLESS PLANTS.

EQUISETACEÆ.

EQUISETUM lævigatum, Braun. (Horse-tail.)—Low. and Mid. Dist.

FILICES. (FERNS.)

POLYPODIUM vulgare, L. (Polypod.)—Mid. and Up. Dist.

hexagonopterum, Michx.—Lincoln and westward.

incanum, Swartz.—Common.

PTERIS aquilina, L. (Brake.)—Do.

PELLÆA atropurpurea, Link. (Rock Brake.)—Mountains.

CHEILANTHES vestita, Swartz. (Lip Fern.)—Wake Co. to Mountains.

tomentosa, Link.—Mountains.

ADIANTUM pedatum, L. (Maiden-hair. Hair Fern.)—Common.

WOODWARDIA angustifolia, Smith.—Low. Dist.

Virginica, Willd.—Do.

CAMPTOSORUS rhizophyllus, Link. (Walking leaf.)—Mountains.

ASPLENIUM pinnatifidum, Nutt. (Spleen-wort.)—Do.

Trichomanes, L.—Lincoln and westward.

ebeneum, Ait.—Common.

angustifolium, Michx.—Mountains.

montanum, Willd.—Orange Co. to Mountains.

Ruta-muraria, L.—Mountains.

thelypteroides, Michx.—Do. (*Michaux.*)

Filix-femina, Bernh.—Common.

CYSTOPTERIS fragilis, Bernh. (Bladder Fern.)—Mountains.

bulbifera, Bernh.—Mountains.

ASPIDIUM Thelypteris, Swartz. (Wood Fern.)—Up. Dist.

Noveboracense, Willd.—Mid. and Up. Dist.

spinulosum, Swartz.—Mountains.

“ *var: dilatatum*.—Do.

marginale, Swartz.—Do.

acrostichoides, Swartz.—Common.

ONOCLEA sensibilis, L. (Sensitive Fern.)—Common.

WOODSIA Ilvensis, R. Br.—Mountains.

obtusa, Torr.—Do.

DICKSONIA pilosiuscula, Kunze.—Do.

LYGODIUM palmatum, Swartz. (Climbing Fern.)—Mountains.
(*Buckley.*)

OSMUNDA regalis, L. (Flowering Fern.)—Common.

Claytoniana, L.—Mountains.

cinnamomea, L.—Common.

BOTRYCHIUM Virginicum, Swartz. (Moonwort.)—Mountains.

lunarioides, Swartz.—All the Districts.

OPHIOGLOSSUM vulgatum, L. (Adder's Tongue.)—Up. Dist.

LYCOPODIACEÆ.

LYCOPODIUM lucidulum, Michx.—Mountains.

Selago, L.—Do.

alopencuroides, L.—Low. Dist. to Wake.

clavatum, L. (Club Moss.)—Mountains.

dendroideum, Michx. (Ground Pine.)—Do.

Carolinianum, L.—Low. Dist.

complanatum, L.—Mountains.

SELAGINELLA rupestris, Spring.—Low. and Up. Dist.

apus, Spring.—Common.

HYDROPTERIDÆ.

AZOLLA Caroliniana, Willd.—Low. Dist.

MUSCI OR MOSSES.

SPHAGNUM cymbifolium, Dill.—Common. Bogs and Swamps.

compactum, Brid.—Up. Dist. Springy places.

Lescurii, Sull.—Low. and Up. (Lesquereux.) Wet ground.

Schraderi, Sull.—(Sull.) Wet ground.

humile, Schimp.—Up. (Lesq.) Wet ground.

cyclophyllum, Sull.—Low. and Up.? Swamps.

sedoides, Brid.—Mountains. (Lesq.) Springy places.

macrophyllum, Bernh.—Low. Swamps.

acutifolium, Ehrh.—Common. Morasses.

molle, Sull.—Mountains. (Gray.) Wet places.

cuspidatum, Ehrh.—Common. Swamps.

tabulare, Sull.—Mountains. (Sulliv.) Wet rocks.

- ANDRÆA rupestris*, Turn.—Mountains. (Sull.) On rocks.
- PHASCUM serratum*, Schreb.—(Sull.) Damp ground.
- crassinervium*, Schwægr.—(Sull.) Earth in woods.
- coherens*, Hedw.—(Sull.) River banks.
- patens*, Hedw.—(Sull.) On clay soil.
- muticum*, Schreb.—Mid. Naked earth.
- subulatum*, Schreb.—(Sull.) Earth.
- crispum*, Hedw.—(Sull.) Do.
- BRUCHIA flexuosa*, Schwægr.—Low. Sides of ditches.
- brevifolia*, Sull.—Low. Earth.
- Ravenelii*, Wils.—Low. Grassy land.
- WEISIA viridula*, Brid.—Common. Grass lands.
- RHABDOWEISIA denticulata*, Br. & Sch.—Mts. (Sulliv.) On rocks.
- CAMPYLOPUS flexuosus*, Brid.—Mts. (Sulliv.) Rocks.
- TREMATODON longicollis*, Rich.—Mid. and Up. Clayey soil.
- DICRANUM varium*, Hedw.—Mid. and Up. Clay banks.
- heteromallum*, Hedw.—Common. Wet ground.
- interruptum*, Br. & Sch.—Mts. (Sull.) On rocks.
- longifolium*, Hedw.—Mountains. (Ravenel.) Rocks.
- scoparium*, L.—Common. Earth and rocks.
- elongatum*, Schwægr.—Mts. Earth.
- congestum*, Brid.—Mts. Rocks.
- spurium*, Hedw.—Low. & Mid. (Sull.) Sandy soil.
- CERATODON purpureus*, Brid.—Low. & Mid. Sandy ground.
- LEUCOBRYUM minus*, Hampe.—Low. & Mid. Earth.
- glaucum*, Hampe.—Common. Moist ground.
- FISSIDENS bryoides*, Hedw.—Mid. & Up. Shaded banks.
- Ravenelii*, Sull.—Low. Side of ditches.
- osmundioides*, Hedw.—Mts. (Sull.) Base of trees.
- subbassilaris*, Hedw.—Mid. Old logs and trees.
- taxifolius*, Hedw.—Low. Earth in woods.
- adiantoides*, Hedw.—Low. Wet ground.
- CONOMITRUM Julianum*, Mont.—Low. Shallow streams.
- TRICHOSTOMUM vaginans*, Sull.—Low. Side of ditches.
- glaucescens*, Hedw.—Up. (Sull.) Earth.
- tortile*, Schrad.—Mid. & Up. Clay soil.
- pallidum*, Hedw.—Common. Clay soil.
- BARBULA unguiculata*, Hedw.—Mid. Earth.
- cæspitosa*, Schwægr.—Low. & Mid. Earth and walls.

- RARBULA* tortuosa, W. & M.—Mts. (Sull.) Wet rocks.
 ruralis, Hedw.—Up. (Sull.) On rocks.
- DESMATODON* plinthobius, Sull. & Lesq.—Low. Brick walls.
- TETRAPHIS* pellucida, Hedw.—Mid. & Up. Earth in woods.
- ZYGODON* Sullivantii, Mull.—Mts. (Sull.) On rocks.
- DRUMMONDIA* clavellata, Hook.—Common. Trunks of trees.
- ORTHOTRICHUM* cupulatum, Hoff.—Up. (Sull.) On Rocks.
 exiguum, Sull.—Low. (Sull.) On Trees.
 strangulatum, Beauv.—Common. Trees.
 Hutchinsiae, Smith.—Mts. Rocks.
 crispum, Hedw.—Mts. Trees.
- PTYCHOMITRIUM* incurvum, Schwægr.—Mts. (Sull.) Rocks.
 Drummondii, H. & W.—Low. Trees and roofs.
- GRIMMIA* apocarpa, Hedw.—Up. On rocks.
 Pennsylvanica, Schwægr.—Mid. and Up. Rocks.
- HEDWIGIA* ciliata, Ehrh.—Mid. and Up. Rocks.
- BUXBAUMIA* aphylla, Haller.—Up. (Sull.) Earth.
- DIPHYSCIUM* foliosum, W. & M.—Mts. Earth.
- ATRICHUM* undulatum, Beauv.—Up. (Sull.) Clay banks.
 angustatum, Beauv.—Common. Shady woods.
- POGONATUM* brevicaulis, Brid.—Mid. and Up. Clay banks.
 brachyphyllum, Michx.—Low. Sandy banks.
- POGONATUM* urnigerum, Brid.—Mts. (Sull.) Earth.
 capillare, Brid.—Mts. (Sull.) Earth.
 alpinum, Brid.—Mts. (Sull.) Earth.
- POLYTRICHUM* commune, L.—Low. and Mid. Damp sandy soil.
 formosum, Hedw.—Mts. Earth around trees.
 piliferum, Schreb.—Mts. (Sull.) Rocky soil.
- AULACOMNION* palustre, Schwægr.—Low. Swampy ground.
 heterostichum, Br. & Sch.—Mid. and Up. Shaded
 banks.
 androgynum, Schwægr.—Mts. (Sull.) Rocky ground.
- BRYUM* pyriforme, Hedw.—Mid. and Up. Moist ground
 erudum, Schreb.—Mts. (Sull.) Earth.
 annotinum, Hedw.—Mts. (Sull.) Earth.
 elongatum, Dicks.—Mts. (Sull.) Crevices of rocks.
 roseum, Schreb.—Mid. and Up. Shady woods.
 argenteum, L.—Mid. and Up. On roofs, open ground, &c.
 pseudo-triquetrum, Schwægr.—Up. (Sull.) Wet rocks.

- BRYUM** cernuum, Hedw.—Up. (Sull.) Damp woods.
 intermedium, Brid.—Low. Brick walls.
 capillare, Hedw.—Up. (Sull.) Rocks.
 caespitium, L.—Mid. and Up. Earth and rocks.
 atropurpureum, W. & M.—Mts. (Sull.) Earth.
- MXIUM** affine, Bland.—Common. Shady banks.
 stellare, Hedw.—Up. (Sull.) Borders of streams.
 punctatum, Hedw.—Mts. Damp earth.
 serratum, Brid.—Mts. (Sull.) Margin of rivulets.
 rostratum, Schwægr.—Up. (Sull.) Along streams.
 cuspidatum, Hedw.—Mid. and Up. Base of trees.
- BARTRAMIA** pomiformis, Hedw.—Mid. and Up. Damp shaded ground.
 fontana, Brid.—Mid. and Up. Springy ground.
 calcarea, Br. & Sch.—Mountains. (Lesqur.) Wet rocks.
 radicalis, Beauv.—Low. Side of streams.
- FUNARIA** hygrometrica, Hedw.—Mid. and Up. Earth.
 flavicans, Michx.—Low. Earth.
 serrata, Beauv.—Low. Earth.
- EXTOSTHODON** Drummondii, Sull.—(Sull.) Clayey soil.
- PHYSCOMITRIUM** pyriforme, Br. & Sch.—Low. Damp woods.
- PETRAPLODON** australis, Sull. & Lesq.—Low. In swamps.
- FONTINALIS** disticha, H. & W.—(Sull.) In rivulets.
 Lescurii, Sull.—Mountains. (Lesquer.) Streams.
 squamosa, L.—Mountains. In streams.
- DICHELYMA** capillaceum, Bryol. Eur.—(Sull.) In rivulets.
 subulatum, Myrin.—(Sull.) Rivulets.
- CRYPHLEA** glomerata, Schimp.—Low. & Mid. On trees.
 nervosa, H. & W.—Do. On trees.
- LEUCODON** julaceus, Hedw.—Low. & Mid. On trees.
 brachypus, Brid.—Mts. On trees.
- LEPTODON** trichomitrium, Mohr.—Up. On trees.
 iminersum, Sull. & Lesq.—(Sull.) On trees.
- ANTITRICHIA** curtispindula, Brid.—Mts. (Lesq.) Earth.
- ANOMODON** viticulosus, H. & T.—Mts. Rocks.
 apiculatus, Br. & Sch.—Do. (Sull.) Old logs.
 obtusifolius, Br. & Sch.—(Sull.) Trees.
 attenuatus, Hub.—Mid. Rocks and trees.
 tristis, Cesat.—Mid. & Up. Trees.

- LESKEA polycarpa*, Hedw.—(Sull.) Base of trees.
obscura, Hedw.—Mid. Base of trees.
rostrata, Hedw.—Mid. & Up. Base of trees.
denticulata, Sull.—Mts. (Sull.) Do.
- CLASMATODON parvulus*, Hampe.—Low. Trunk of trees.
- THELIA hirtella*, Hedw.—Low. & Mid. Trunk of trees.
Lescurii, Sull.—(Lesq.) Sandy ground.
- MYURELLA Careyana*, Sull.—Mountains. (Sull.) Earth.
- FABRONIA Ravenelii*, Sull.—(Sull.) Rocks.
Caroliniana, Sull. & Lesq.—(Sull.) Decayed logs.
- ANACAMPTODON splachnoides*, Brid.—Mid. Hollow trees.
- PYLAISEA intricata*, Hedw.—Mid. Roofs & trunks of trees.
- HOMALOTHECIUM subcapillatum*, Bryol. Eur.—Mid. On trees.
- PLATYGYRIUM repens*, Bryol. Eur.—Mid. & Up. Rotten logs, &c.
- CYLINDROTHECIUM seductrix*, Bryol. Eur.—Common. Decaying wood.
cladorrhizans, Bry. Eur.—Mid. & Up. Old logs.
compressum, Bry. Eur.—Low. & Mid. Trees.
Sullivantii, C. Mull.—Up. (Sull.) Stones.
Drummondii, Schimp.—Up. (Rav.) Rocks & Trees.
brevisetum, Bry. Eur.—Mid. Trees.
- NECKERA pennata*, Hedw.—Mts. Trunks of trees.
complanata, Bry. Eur.—Mts. On rocks.
- HOOKERIA acutifolia*, Hook?—Mts. (Sull.) Earth.
- CLIMACIUM Americanum*, Brid.—Up. Earth and logs.
- HYPNUM tamariscinum*, Hedw.—Common. Earth and logs.
delicatulum, L.—Mts. (Sull.) Earth.
minutulum, Hedw.—Common. Logs and walls.
scitum, Beauv.—Up. (Sull.) Base of trees.
gracile, Br. & Sch.—Mts. Old Logs.
triquetrum, L.—Mid. and Up. Earth in woods.
brevirostre, Ehrh.—Mts. Rocks and base of trees.
splendens, Hedw.—Up. On earth in woods.
umbratum, Ehrh.—Mts. (Sull.) Rocks.
Alleghaniense, C. Mull.—Mts. (Sull.) Borders of rivulets.
hians, Hedw.—Low. Earth.
Boscii, Schwægr.—Up. Earth.
serrulatum, Hedw.—Up. (Rav.)—On the ground.

- HYPNUM** *rusciforme*, Weis.—Up. Rocks in streams.
demissum, Wils.—Mts. (Sull.) Moist rocks.
microcarpum, C. Mull.—Common. Trunks of trees.
cylindrocarpum, C. Mull.—Mts. (Sull.) On logs.
recurvans, Schwægr.—Common. Earth and rocks.
albulum, C. Mull.—Common. Damp ground.
engyrium, Bry. Eur.—Mts. Wet ground.
molle, Dicks.—Mts. Margin of streams.
euspidatum, L.—(Sull.) Marshy places.
cordifolium, Hedw.—(Sull.) In Swamps.
uncinatum, Hedw.—Mts. (Sull.) Rocks and logs.
fluitans, L.—(Sull.) Swamps.
aduncum, Hedw.—Mts. Swampy grounds.
molluscum, Hedw.—Mid. and Up. Earth and rocks.
cupressiforme, L.—Mts. Trees and earth.
imponens, Hedw.—Mid. and Up. Earth and logs.
reptile, Michx.—Mts. Decaying logs.
curvifolium, Hedw.—Mid. and Up. Earth and logs.
nemosum, Koch.—Mts. (Sull.) Decayed logs.
rugosum, Ehrh.—Up. (Sull.) Limestone rocks.
salebrosum, Hoffm.—Common. Earth and logs.
acuminatum, Beauv.—Up. Earth and logs.
rutabulum, L. (Sull.) Springy ground.
plumosum, L.—Mts. (Sull.) Earth.
stellatum, Schreb.—Mid. and Up. Marshy ground.
hispidulum, Brid.—Mid. and Up. Earth.
serpens, Hedw.—Common. Rocks, logs and earth.
radicale, Brid.—Common. Rocks, logs and earth.
riparium, Hedw.—Low. Swampy ground.
Lescurii, Sull.—Mts. (Sull.) Wet rocks.
denticulatum, L.—Up. (Sull.) Rocks and Swamps.
Muhlenbeckii, Bry. Eur.—Mts. (Sull.) Earth and rocks.
fulvum, H. & W.—Low. In water.
sylvaticum, L.—Mts. (Sull.) Earth.

HEPATICÆ OR LIVERWORTS.

RICCIA glauca, L.—Common. Damp ground.

Intescens, Schwein.—Low. and Mid. Damp ground.

SPILÆROCARPUS Michellii, Bellard.—Low. and Mid. Cult. ground.

ANTHOCEROS punctatus, L.—Common. Side of ditches, &c.

lævis, L.—Common. Moist earth.

laciniatus, Schwein.—Mid. (Schwein.) Wet gravelly ground.

NOTOTHYLAS orbicularis, Sull.—Mid. (Schwein.) Damp ground.

MARCHANTIA polymorpha, L.—Common. Damp ground.

DUMORTIERA hirsuta, Nees.—Common. Face of rocks.

FEGATELLA conica, Cda.—Mid. and Up. Moist ground.

REBOULIA hemispherica, Raddi.—Low. and Mid. Springy ground.

FIMBRIARIA tenella, Nees.—Common. Shaded ground.

METZGERIA furcata, Nees.—Mid. and Up. Rocks and base of trees.

pubescens, Raddi.—Up. (Schwein.) Rocks and base of trees.

ANEURA sessilis, Spreng.—Low. Rotten wood.

pinguis, Dum.—Mid. (Schwein.) Among Swamp Moss.

palmata, Nees.—Mid. Wet earth and wood.

multifida, Dum.—Common. Wet earth and wood.

STEETZIA Lyellii, Lehm.—Low. and Mid. Wet ground.

PELLIA epiphylla, Nees.—Mid. and Up. Wet ground.

FOSSOMBRONIA pusilla, Nees.—Low. and Mid. Wet ground.

GEOCALYX graveolens, Nees.—Low. and Mid. Rotten logs and wet rocks.

CHILOSCYPHUS polyanthos, Cda.—Mid. (Schwein.) Rocks and wet ground.

ascendens, H. & W.—(Sulliv.) Rotten logs, &c.

LOPHOCOLEA heterophylla, Nees.—(Sull.) Rotten logs.

SPHAGNICÆTIS communis, Nees.—Common. Damp mossy places.

SCAPANIA nemorosa, Nees.—Common. Wet rocks and earth.

undulata, Nees and Mont.—Mid. (Schwein.) Boggy lands.

JUNGERMANNIA setacea, Web.—Mid. and Up. Wet ground.

trichophylla, L.—Up. (Sull.) Decayed wood, &c.

- JUNGERMANNIA** *convivens*, Dicks.—Common. Decayed wood, &c.
curvifolia, Dicks.—Mid. (Schwein.) Decayed woods, &c.
bienerspidata, L.—Mid. and Up. Decayed wood, &c.
setiformis, Ehrh.—Up. (Sull.) Decayed wood, &c.
barbata, Schreb.—Up. (Sull.) Earth and rocks.
Michauxii, Web.—Mid. and Up. Side of wet rocks.
incisa, Schrad.—Mid. (Schwein.) Damp earth.
Schraderi, Mart.—Low. and Mid. Earth and logs.
crenulata, Sm.—Mid. Wet rocks, &c.
exsecta, Schmidel.—Mid. (Schwein.) Earth and wood.
obtusifolia, Hook.—Mid. and Up. Earth and rocks.
albicans, L.—Mid. (Schwein.) Earth.
- PLAGIOCHILA** *spinulosa*, N. & M.—Mts. (Sull.) Banks of rivulets.
asplenioides, N. & M.—Mid. and Up. (Schw.) Banks of rivulets.
porelloides, Lind.—Up. Swampy ground.
- SARCOSCYPHUS** *Ehrharti*, Cda.—Mts. (Sull.) Rocks.
- FRULLANIA** *Grayana*, Mont.—Mid. and Up. Rocks and trees.
Caroliniana, Sull.—Low. Bark of trees.
Hutchinsiae, Nees.—Mts. (Sull.) Wet rocks.
Virginica, Lehm.—Low. and Mid. Trees and old roofs.
Eboracensis, Lehm.—Low. and Mid. Bark of trees.
plana, Sull.—Mts. (Sull.) Rocks.
aeolotis, Nees.—Mid. and Up. Rocks, logs, &c.
- LIEBENIA** *clypeata*, Schwein.—Common. Trees and rocks.
longiflora, Tayl.—(Sull.) Trees.
calyculata, Tayl.—Mts. (Sull.) On Lichens.
serpyllifolia, Lib.—Low. and Mid. Rocks and trees.
cucullata, Nees.—Mts. (Sull.) Rocks.
- MALOTHECA** *porella*, Nees.—Common. Earth and rocks.
playthylla, Dum.—Mid. and Up. Trees and rocks.
Wataugensis, Sull.—Mts. (Sull.) Old logs.
- RADULA** *complanata*, Dum.—Mid. (Schwein.) Bark of trees.
pallens, Nees.—Mts. (Sull.) Old logs.
- PTILIDIUM** *ciliare*, Nees.—(Sull.) Rotten logs.
- SEXTNERA** *juniperina*, Nees.—Mts. (Sull.) Earth.

- TRICHOCOLEA Tomentella, Nees.—Mid. and Up. Damp ground.
 MASTIGOBRYUM trilobatum, Nees.—Common. Damp ground.
 LEPIDIZIA reptans, Nees.—Mts. (Sull.) Wet rocks.
 CALYPOGHEIA Trichomanis, Cda.—Low. Wet ground.

LICHENES.

COLLEMACEI.

- ENCHYLIMUM polyocceum, (Nyl.)—Mid. Dist. On rocks.
 COLLEMA flaccidum, Ach.—Mid. and Up. Rocks.
 pulchellum, Ach.—Low. and Mid.—On Trunks.
 tenax, (Sw.) Ach.—Mid. (Schwein.) On the earth.
 limosum, Ach.—Mid. (Schwein.) On the earth.
 nigrescens, (L.) Ach.—Mid. and Up. Rocks and trunks.
 cyrtaspis, Tuck.—Mid. and Up. Trunks.
 leptaleum, Tuck.—Mid. and Up. Trunks.
 pycnocarpum, Nyl.—Mid. On trunks.
 LEPTOGIUM lacerum, (Sw.) Fr.—Mid. (Schwein.) Earth among
 Mosses.
 Corticola, (Tayl.) Tuck.—Mid. and Up. Mossy trunks
 and rocks.
 tremelloides, (L.) Fr.—Common. Trunks and rocks.
 saturninum, (Dicks.) Nyl.—Mid. and Up. Trunks and
 rocks.
 chloromelum, (Sw.) Nyl.—Mid. (Schwein.) and Up.
 Trunks and rocks.
 MYRIANGIUM Curtisii, Mont. and Berk.—Common. On trunks of
 Nyssa, Crataegus, &c.

LICHENACEI.

- CALICUM trachelinum, Ach.—Mid. and Up. On dead wood.
 quercinum, Pers.—Mid. (Schwein.) Trunks.
 CONIOCYBE furfuracea, (L.) Fr.—Mid. (Schwein.) Trunks.
 CONIOCYBE albella, Schwein.—Mid. (Schwein.) Trunks.

- BLÉOMYCES** *ericetorum*, (L.) D. C.—Common. Earth.
- CLADONIA** *Papillaria*, (Ehrh.) Hoffm.—Common. Earth.
cespiticia, Fl.—Up. Trunks.
pyxidata, (L.) Fr.—Common. Earth.
gracilis, (L.) Fr.—Common. Earth.
fimbriata, (L.) Fr.—Mid. and Up. Earth.
furecata, (Schreb.) Fl.—Mid. and Up. Earth.
squamosa, Hoffm.—Common. At base of trees, &c.
rangiferina, (L.) Hoffm.—Common. Earth.
uncialis, Fr.—Up. Earth.
Caroliniana, Schwein.—Mid. and Up. (Schw.) Earth.
Mitrula, Tuck.—Low. and Mid. Earth.
Georgiana, Tuck.—Mid. and Up. Earth.
cornucopioides, (L.) Fr.—Up. (Rav.) Earth.
cristatella, Tuck.—Common. Earth.
macilenta, Hoffm.—Up. Earth and rotten logs.
pulchella, (Schwein.) Tuck.—Mid. (Schwein.) Earth.
cetrarioides, (Schwein.) Tuck.—Mid. (Schwein.) Earth.
leporina, (Fr. IIb.) Tuck.—Low. and Mid. Earth.
- STEREOCAULON** *sphærophoroides*, Tuck.—Mts. Earth.
- USNEA** *barbata*, Fr.—Common. Limbs of trees.
trichodea, Ach.—Low. and Mid. Limbs of trees.
angulata, Ach.—Mid. (Schwein.) Limbs of trees.
- ALECTORIA** *jubata*, (L.) Ach.—Mid. and Up. Old rails and rocks.
- RAMALINA** *calicaris*, Fr.—Common. Trees, rails, &c.
- EVERNIA** *furfuracea*, (L.) Mann.—Mid. and Up. Limbs and trunks.
- CETRARIA** *Islandica*, (L.) Ach.—Grandfather and Black Mts. Earth.
lacunosa, Ach.—Mid. and Up. Trunks.
ciliaris, Ach.—Mid. and Up. Trunks and old rails.
Oakesiana, Tuck.—Mts. Trunks.
juniperina, (L.) Ach.—Common. Trunks and limbs.
- NEPHROMA** *tomentosum*, (Hoffm.) Kærst.—Mid. (Schwein.) Trunks.
Helveticum, Ach.—Low. and Mid. Trunks and rocks.
- PELTIGERA** *aphthosa*, (L.) Hoffm.—Up. (Rav.) Earth.
canina, (L.) Hoffm.—Mid. and Up. Earth and trunks.
rufescens, (Neck.) Hoffm. Common. Trunks.
polydactyla, (Neck.) Hoffm.—Common. Rocks and trunks.
- STICTA** *pulmonaria*, (L.) Ach.—Common. Trunks.

- STICTA** *quercizans*, (Michx.) Ach.—Mts. Trunks and rocks.
glomerulifera, (Lightf.) Delise.—Mts. Trunks and rocks.
Ravenelii, Tuck.—Low. Trunks.
crocata, (L.) Ach.—Mts. (Buckl.) Rocks.
aurata, (Sm.) Ach.—Common. Rocks and trees.
- PARMELIA** *perlata*, (L.) Ach.—Common. Rocks and trees.
crinita, Ach.—Mid. and Up. Trunks.
perforata, Ach.—Mid. and Up. Trunks.
laevigata, (Sm.) Ach.—Common. Trunks.
aurulenta, Tuck.—Up. Trunks and rocks.
tiliacea, (Ehrh.) Ach.—Common. Trunks and rails.
Borreri, Turn.—Low. and Mid. Trunks.
aleurites, Ach.—Mts. (Rav.) Trunks and rails.
colpodes, Ach.—Mid. and Up. Trunks.
olivacea, Ach.—Mts. (Rav.) Trunks.
caperata, (L.) Ach.—Common. Trunks and stones.
conspersa, (Ehrh.) Ach.—Common. Rocks and stones.
ambigua, Ach.—Common. Trunks and dead wood.
- PHYSCIA** *chrysophthalma*, (L.) D. C.—Low. On trees.
parietina, (L. Duf.) Nyl.—Common. On trees.
candelaria, (Ach.) Nyl.—Low. and Mid. On trees.
aquila, Ach. (Nyl.)—Mid. and Up. Trunks.
speciosa, (Wulff. Fr.)—Common. Trunks.
stellaris, (L.)—Common. Trunks and rocks.
obscura, (Ehrh.) Nyl.—Mid. and Up. Trees.
picta, (Ach.) Nyl.—Low. Trunks.
- UMBILICARIA** *mammulata*, Ach.—Mts. Rocks.
Pennsylvanica, Hoffm.—Mts. Rocks.
pustulata, Hoffm.—Mid. and Up. Rocks.
Muhlenbergii, (Ach.) Tuck.—Mid. (Schwein.) and Up. Rocks.
Dillenii, Tuck.—Mid. and Up. Rocks.
- PYXINE** *Cocoes*, (Sw.) Nyl.—Mid. and Up. Trunks, woods and rocks.
- PANNARIA** *rubiginosa*, (Thunb.) Delis.—Mid. and Up. Trees.
leucosticta, Tuck.—Mid. (Schwein.) Rocks and trees.
tryptophylla, (Ach. Fr.) Nyl.—Mid. and Up. Rocks and trees.
- COCCOCARPIA** *stellata*, Tuck.—Low. Trunks.

- COCCOCARPIA* *parmelioides*, (Hook.)—Common. Trunks and rocks.
Micheneri, Tuck.—Mid. Base of trunks.
- HEPPIA* *Despreauxii*, (Mont.)—Low. and Mid. Earth.
- AMPHILOMA* *labuginosum*, (Fr.) Nyl.—Mid. (Schwein.) Rocks.
- SQUAMARIA* *Frostii*, Tuck.—Mid. and Up. Granite rocks.
- LECANORA* *cerina*, (Hedw.) Ach.—Mid. and Up. Trunks and rocks.
aurantiaca, (Lightf.) Nyl.—Mid. Trunks and rocks.
cinnabarina, Ach.—Mid. Rocks.
camptidia, Tuck.—Low. Trunks.
ferruginea, (Huds.) Nyl.—Mid. Trunks.
cervina, (Pers.) Sommerf.—Mid. and Up. Rocks.
chrysops, Tuck.—Mid. Rocks.
Myrini, (Fr.)—Mid. Rocks.
tartarea, (L.) Ach.—Mid. and Up. Rocks.
palleescens, (L.) Schaer.—Mid. Trunks.
pallida, (Schreb.) Schaer.—Low. and Mid. Trunks.
subfusca, (L.) Ach.—Common. Trunks and rocks.
Cenisia, Ach.—Mid. (Schwein.) Rocks.
Berica, Tuck.—Mid. Trees.
varia, (Ehrh.) Ach.—Common. Trunks and old wood.
orosthea, Ach.—Mid. (Schwein.) Rocks.
atra, (Huds.) Ach.—Mid. Rocks.
oreina, Ach.—Mid. Rocks.
chrysomelæna, Ach.—Mid. Rocks.
sophodes, Ach.—Mid. Trunks and rocks.
punicea, Ach.—Low. Trunks.
ochrophæa, Tuck.—Mts. Balsam trunks.
- URCEOLARIA* *lepadina*, (Sommerf.)—Mid. (Schwein.) Rocks.
actinostoma, Pers.—Mid. (Schwein.) Rocks.
- PERTUSARIA* *pertusa*, (L.)—Common. Trunks.
pilulifera, (Pers.) Nyl.—Mid. Trunks.
faginea, (L.)—Mid. Trunks.
hymenia, (Ach.)—Mid. (Schwein.) Trunks.
globularis, (Ach.)—Mid. and Up. On mosses.
leioplaca, (Ach.) Nyl.—Mid. Trunks.
- THELOTREMA* *Ravenelii*, Tuck.—Low. and Mid. Base of trunks.
subtile, Tuck.—Low. Trunks.
- GYMNOTREMA* *atratum*, (Fee.) Nyl.—Low. Trunks.
- LECIDEA* *pineti*, (Schräd.) Ach.—Mid. (Schwein.) On the earth.
Russellii, Tuck.—Up. Rocks.

- LECIDEA** *rufonigra*, Tuck.—Mid. and Up. Rocks.
chlorostieta, Tuck.—Low. Pine and Cypress trunks.
parvifolia, Pers.—Common. Trunks.
absconsa, Tuck.—Low. (Tuckerm.) Red Oak Trunks.
microps, (Fr.) Tuck.—Mid. (Schwein.) Trunks.
russula, Ach.—Common. Trunks.
spadicea, Ach.—Low. and Mid. Trunks.
sanguineoatra, Ach.—Mid. (Schwein.) On Mosses.
anomala, Fr.—Mid. (Schwein.) Trunks.
uliginosa, Ach.—Mid. Earth.
recedens, Nyl.—Low. Dead wood.
leucoblephara, Nyl.—Low. On bark.
exigua, Chaub.—Common. Trunks.
luteola, Ach.—Mid. Trunks.
Schweinitzii, Fr.—Low. and Mid. Bark of trunks.
Elizae, Tuck.—Low. Pine bark.
pachycheila, Tuck.—Low. Trunks.
Domingensis, (Ach.)—Low. Trunks.
leucoxantha, Spreng.—Low. and Mid. Trunks.
parasema, (Ach.) Nyl.—Low. Trunks.
 “ var: *enteroleuca*.—Mid. Rocks.
lactea, Massal.—Mid. (Schwein.) Rocks.
atroalba, Fr.—Mid. (Schwein.) Rocks.
petræa, Flot.—Mid. Rocks.
contigua, Fr.—Mid. and Up. Rocks.
rivulosa, Ach.—Mid. (Schwein.) Rocks.
disciformis, (Fr.) Nyl.—Common. Trunks.
CONOTREMA *urceolatum*, (Ach.) Tuck.—Mts: Trunks.
GRAPHIS *scripta*, (L.) Ach.—Common. Bark of trees.
striatula, Ach.—Mid. Trunks.
inusta, Ach.—Low. Trunks.
dendritica, Ach.—Common. Trunks.
Afzelii, Ach.—Low. On bark.
astroæa, Tuck.—Low. Bark of Cypress.
nitida, (Eschw.) Nyl.—Low. Bark.
erumpens, Nyl.—Low. Bark.
Patellula, (Fee.) Nyl.—Low. Bark.
OPEGRAPHIA *oulocheila*, Tuck.—Mid. (Schwein.) Rocks.
 varia, Pers.—Common. Trunks.

- OPEGRAPHIA atra*, Pers.—Common. Trunks.
PLATYGRAPHIA ocellata, Nyl.—Low. Smooth bark.
ARTHONIA cinnabarina, Wallr.—Low. Trunks.
 Caribœa, (Ach.) Nyl.—Mid. Trunks.
 rubella, Fee.—Low. Trunks.
 tædiosa, Nyl.—Low. Trunks.
 spectabilis, Flot.—Mts. (Rav.) Trunks.
 astroidea, Ach.—Mid. Trunks.
 glaucescens, Nyl.—Up. (Rav.) Trunks.
GLYPHIS Achariana, Tuck.—Low. and Mid. Smooth bark.
NORMANDINA Jungermanniæ, Nyl.—Mts. (Rav.) On Mosses.
ENDOCARPON miniatum, Ach.—Mid. (Schw.) and Up. (Rav.) On
 Rocks.
 Muhlenbergii, Ach.—Mid. and Up. On rocks.
 fluviatile, (Web.) D. C.—Mts. (Rav.) Wet rocks.
 Tuckermanni, Mont.—Common. Mossy trunks.
 hepaticum, Ach.—Mid. (Schwein.) Earth.
VERRUCARIA umbrina, (Ach.) Wahl.—Mid. (Schwein.) Granite
 rocks.
 nigrescens, Pers.—Mid. and Up. Rocks.
 fuscella, (Turn.) Ach.—Mid. (Schwein.) Rocks.
 rupestris, Schrad.—Up. Lime rocks.
 diffRACTELLA, Nyl.—Mid. (Schwein.) Rocks.
 epigœa, Pers.—Low. and Mid. On naked earth.
 carpineæ, (Pers.) Ach.—Mid. Trunks.
 Nucula, (Ach.) Nyl.—Low. Trunks.
 pyrenuloides, (Mont.) Nyl.—Low. Trunks.
 Santensis, Tuck.—Low. Trunks.
 nitida, Schrad.—Common. On smooth bark.
 punctella, Nyl.—Low. Trunks.
 thelomorpha, Tuck.—Low. Trunks.
 spinulosa, Schwein.—Mid. (Schwein.) Trunks.
 aggregata, (Fee.) Nyl.—Low. Trunks.
 glabrata, Ach.—Mid. (Schwein.) Trunks.
 gemma, Ach.—Low. Trunks.
 subprostans, Nyl.—Low. Trunks.
 tropica, Ach.—Low. and Mid. Smooth bark.
 prostans, Mont.—Low. Trunks.
 5-septata, Nyl.—Low. Trunks of Holly.

VERRUCARIA epidermidis, Ach.—Common. Smooth bark.

PYRENASTRUM Americanum, Spreng.—Low. Trunks.

simplex, Rav.—Low. Trunks.

Ravenelii, Tuck.—Low. Trunks.

TRYPETHELIUM eruentum, Mont.—Low. Trunks.

scoria, Fee.—Low. and Mid. Trunks.

virens, Tuck.—Mid. Trunks.

Carolinianum, Tuck.—Mid. Trunks.

GYROSTOMUM Curtisii, Tuck.—Mid. Trunks.

FUNGI.

1. HYMENOMYCETES.

AGARICES (I. AMANITA.)

caesareus, Scop.—Common. In Oak forests.

virosus, Fr.—Common. Sandy woods.

vernus, Fr.—Common. Woods.

phalloides, Fr.—Common. Woods.

muscarius, Fr.—Mid. (Schw.) Woods.

monticulosus, Berk. and Curt.—Common. Sandy woods.

pantherinus, D. C.—Common. In woods.

strobiliformis, Vitt.—Common. In woods.

Mappa, Batsch.—Common. In woods.

recutitus, Fr.—Common. In woods.

agglutinatus, B. & C.—Low. Pine woods.

rubescens, Pers.—Low. Damp woods.

polypyraxis, B. & C.—Low. Pine woods.

excelsus, Fr.—Common. Earth in woods.

lenticularis, Fr.?—Mid. Earth in woods.

asper, Fr.—Mid. (Schwein.) Earth in woods.

vaginatus, Bull.—Common. Woods and fields.

farinosus, Schwein.—Mid. (Schw.) Woods.

pubescens, Schwein.—Mid. (Schw.) In grassy land.

(II. LEPiota.)

procerus, Scop.—Common. Woods and fields.

- rachodes*, Vitt.—Mid. Base of stumps and trees.
excoriatus, Fr.—Mid. Grassy lands.
mastoides, Fr.—Common. Woods.
aentesquamosus, Wein.—Low. and Mid. By rotten logs and stumps.
clypeolarius, Bull.—Common. On earth and rotten logs.
cristatus, Bolt.—Common. Gardens and rich swamps.
cepæstipes, Sow.—Mid. (Schw.) Cultivated lands.
granulosus, Batsch.—Common. Woods and cult. grounds.
floralis, Berk. & Rav.—Low. Cultivated grounds.
cultorum, B. & C.—Low. Cultivated grounds.
fulvaster, B. & C.—Low. Sandy grass plats.
aspratus, Berk.—Low. Rotten sticks in swamps.
delicatus, Fr.—Mid. (Schwein.) Damp woods and hedges.

(III. ARMILLARIA.)

- bulbiger*, A. & S.—Low. and Mid. Woods.
robustus, A. & S.—Mid. (Schwein.) Woods.
melleus, Vahl.—Common. About stumps and logs.
mucidus, Schrad.—Mid. (Schw.) On dead Beech.

(IV. TRICHOLOMA.)

- equestris*, L.—Mid. (Schwein.) Pine woods.
sejunctus, Sow.—Mid. (Schw.) Woods.
ustalis, Fr.—Mid. (Schw.) Pine woods.
flavobrunneus, Fr.—Mid. (Schw.) Damp woods.
Russula, Schæff.—Low. Among leaves in woods.
frumentaceus, Bull.—Mid. Pine woods.
scalpturatus, Fr.—Low. Pine logs and stumps.
hypopithyus, M. A. C.—Mid. Pine woods.
Columbetta, Fr.—Mid. (Schw.) Woods.
vaccinus, Pers.—Mid. (Schw.) Woods.
terrens, Schæff.—Mid. (Schw.) Woods and fields.
cuneifolius, Fr.—Mid. (Schw.) Woods and fields.
luteovirens, A. & S.—Mid. (Schw.) Pine woods.
saponaceus, Fr.—Mid. (Schw.) Among fallen leaves.
castus, M. A. C.—Mid. Grassy old fields.
sulfureus, Bull.—Mid. (Schw.) Woods.
albellus, D. C. ?—Mid. Damp woods.
albus, Fr.—Low. Swamps and woods.

consociatus, M. A. C.—Mid. Pine woods.
personatus, Fr.—Low. and Mid. Near rotten logs.
nudus, Bull.—Mid. (Schw.) Woods.
grammopodius, Bull.—Low. Shady woods and swamps.
adstringens, Pers.—Mid. (Schwein.) Woods.
melaleucus, Pers.—Mid. (Schw.) Grassy woods.
brevipes, Bull.—Low. Humous earth.
humilis, Fr.—Low. and Mid. Humous earth.

(V. CLITOCYBE.)

nebularis, Batsch.—Mid. (Schw.) Damp woods.
clavipes, Pers.—Mid. (Schw.) Woods.
fumosus, Pers.—Mid. (Schw.) Grassy woods.
viridis, Scop.—Mid. (Schw.) Woods.
odorus, Bull.—Mid. (Schw.) Woods.
phyllophilus, Fr.—Mid. (Schw.) Woods.
candicans, Pers.—Mid. (Schw.) Damp woods.
illudens, Schwein.—Mid. Base of trees.
opacus, With.—Mid. (Schw.) Pine woods.
giganteus, Sow.—Mid. (Schw.) Borders of Pine woods.
infundibuliformis, Schæff.—Common. Earth and rotten wood.
parilis, Fr. ?—Mid. Woods among leaves.
gilvus, Pers.—Mid. (Schw.) Wooded hill sides.
setisedus, Schwein.—Mid. (Schw.) Among fallen leaves.
cyathiformis, Bull.—Mid. (Schw.) Woods.
brumalis, Fr.—Low. On decayed wood in swamps.
bellus, Pers.—Low. and Mid. Earth and trunks.
laceatus, Scop.—Common. Earth in woods.
cespitosus, M. A. C.—Common. Base of stumps.

(VI. COLLYBIA.)

radicatus, Bull.—Common. Woods.
platyphyllus, Fr.—Low. and Mid. Rotten wood.
maculatus, A. & S.—Mid. (Schw.) Woods.
butyraceus, Bull.—Mid. Rotten trunks.
asenus, Fr.—Mid. (Schw.) Pine woods.
velutipes, Curt.—Mid. and Up. Rotting logs.
stipitarius, Fr.—Mid. and Up. On decaying trunks.
confluens, Pers.—Mid. and Up. Among rotting leaves.
detersibilis, B. & C.—Low. Sandy grass land.

conigenus, Pers.—Low. Rotting Pine-burs.
*cirrhatu*s, Pers.—Low. Damp earth.
tuberosus, Bull.—Mid. (Schw.) On decaying *Agarica*.
collinus, Scop. ?—Low. Pine woods.
ventricosus, Bull.—Low. Rotten logs.
esculentus, Jacq.—Mid. (Schw.) Dense woods.
tenacellus, Pers.—Mid. (Schw.) Pine woods.
dryophilus, Bull.—Mid. Woods.
aeervatus, Fr. ?—Up. Earth.
Clavus, Bull.—Mid. Among Mosses.

(VII. MYCENA.)

elegans, Pers.—Mid. (Schw.) Pine woods.
purus, Pers.—Mid. (Schw.) Shaded places.
iocephalus, B. & C.—Low. Rich swampy woods.
Adonis, Bull.—Mid. (Schw.) On trunks.
lineatus, Bull.—Mid. (Schw.) Grassy lands.
lacteus, Pers.—Mid. (Schw.) Pine woods.
cohaerens, A. & S.—Mid. (Schw.) Earth and trunks.
intertextus, B. & C.—Low. Decaying Pine logs.
galericulatus, Scop.—Common. Earth and rotten wood.
polygrammus, Bull.—Mid. (Schw.) On trunks.
atrocyaneus, Batsch.—Low. Rotten logs.
alcalinus, Fr.—Mid. (Schw.) Trunks.
amictus, Fr.—Mid. (Schw.) Trunks.
haematopus, Pers.—Low. and Mid. Rotten wood.
galopus, Schrad.—Mid. (Schw.) Earth.
epipterygius, Scop.—Common. Rotten wood.
vulgaris, Pers.—Mid. (Schwein.) Earth.
citrinellus, Pers.—Mid. (Schwein.) Pine woods.
stylobates, Pers.—Mid. (Schwein.) On stems of leaves.
corticola, Pers.—Mid. Bark of trunks.
capillaris, Schwein.—Low. Rotting leaves.

(VIII. OMPHALIA.)

chryssoleucus, Fr.—Mid. (Schwein.) Grassy rich lands.
scyphoides, Fr.—Common. Cultivated grounds.
chrysophyllus, Fr. ?—Low. Rotten logs.
xanthophyllus, B. & C.—Low. Rotten logs.

pyxidatus, Bull.—Common. Grassy places.
Epichysium, Pers.—Mid. (Schw.) Rotting wood.
muralis, Sow.—Low. Damp woods.
umbelliferus, L.—Common. Damp woods.
stellatus, Fr.—Common. On trunks.
campanella, Batsch.—Common. Rotten wood.
setipes, Fr.—Low. Sphagnous swamps.
centenarius, B. & C.—Low. Rotten logs.
fibula, Bull.—Mid. (Schw.) Damp mossy places.
integrellus, Pers.—Mid. (Schw.) Swamps.
Muscorum, Hoffm.—Mid. (Schw.) Mosses at base of trees.

(IX. PLEUROTUS.)

dryinus, Pers.—Mid. (Schwein.) Dead trunks.
ulmarius, Sow.—Mid. (Schwein.) Dead trunks.
tessulatus, Bull.—Mid. (Schwein.) Pine trunks.
Pometi, Fr.—Mid. Carious wood.
glandulosus, Bull.—Mid. (Schw.) Dead trunks.
ostreatus, Jacq.—Mid. (Schw.) Dead trunks.
salignus, Pers.—Common. On trunks and stumps.
petaloides, Bull.—Low. and Mid. On Pine wood.
serotinus, Schrad.—Mid. (Schw.) Trunks.
planus, A. & S.—Mid. (Schw.) Trunks.
nidulans, Pers.—Mid. (Schw.) Pine trunks.
septicus, Fr.—Mid. On dead Polyporus.
mastrucatus, Fr.—Common. Dead wood.
atrocæruleus, Fr.—Common. Dead trunks.
algidus, Fr.—Common. Dead wood and sticks.
fluxilis, Fr.—Low. Rotten wood.
niger, Schwein.—Common. Dead limbs and twigs.
applicatus, Batsch.—Common. Dead bark and wood.
striatulus, Fr.—Low. Dead wood.
perpusillus, Wein.—Low. On bark.

(X. VOLVARIA.)

bombycinus, Schæff.—Low. and Mid. Earth and carious wood.
volvaceus, Bull.—Mid. (Schwein.) Rich cult. ground.
parvulus, Wein.—Low. and Mid. Cult. grounds.

parvulus, var: *major*, B. & C.—Low. Woods.
speciosus, Fr.—Low. Grassy land.
emendatior, B. & C.—Low. Earth.
gloiocephalus, D. C.—Low. Cult. lands.

(XI. PLUTEUS.)

cervinus, Schæff.—Mid. (Schwein.) Dead trunks.
Curtisii, Berk.—Low. and Mid. Carious wood.
leoninus, Schæff.—Mid. (Schw.) Dead trunks.
nanus, Pers.—Mid. (Schw.) Dead trunks.
chrysophlebius, B. & R.—Low. Dead trunks.

(XII. ENTOLOMA.)

prunuloides, Fr.—Low. Dry Swamps.
sericellus, Fr.—Low. ? and Mid. Grassy lands.
elodes, Fr.—Mid. Woody hill-sides.
nauseosus, M. A. C.—Mid. Old fields under Cedars.
elypeatus, L.—Mid. (Schw.) Swampy ground.
turbidus, Fr. ?—Mid. (Schw.) Among rotten sticks.

(XIII. CLITOPILUS.)

Prunulus, Scop.—Low. and Mid. Damp woods.
popinalis, Fr.—Low. and Mid. Swampy lands.
carneo-albus, With.—Low. and Mid. Earth.

(XIV. LEPTONIA.)

serrulatus, Fr.—Mid. and Up. ? (Schw.) In woods.
chalybæus, Pers.—Mid. (Schw.) Swamps.
apularum, B. & C.—Low. Rotten wood in swamps.

(XV. NOLANEA.)

pascuus, Pers.—Mid. & Up. ? (Schw.) Woods and pastures.
mammosus, L.—Low. and Mid. Open woods.
hirtipes, Schwein.—Low. Sphagnous swamps.

(XVI. ECCILIA.)

atrides, Batsch.—Up. Rotten wood.

(XVII. PHOLIOTA.)

aureus, Math.—Low. and Mid. Buried wood.
præcox, Pers.—Low. and Mid. Grassy lands.
adiposus, Batsch.—Mid. Mulberry trunks.
aurivellus, Batsch.—Mid. (Schw.) Dead Alders.
squarrosus, Mull.—Mid. (Schw.) Oak stumps.

tuberculosis, Fr.—Mid. (Schw.) Trunks.
mutabilis, Schæff.—Mid. (Schw.) Trunks.

(XVIII. *HEBELOMA*.)

lanuginosus, Bull.—Low. Earth in woods.
lacerus, Fr.—Low. Pine woods.
Bongardi, Wein.—Low. Woods.
rimosus, Bull.—Common. Woods.
trechisporus, Berk.—Low. Decayed wood.
geophyllus, Sow.—Mid. (Schwein.) Woods.
scabrellus, Fr.—Mid. (Schw.) Among leaves and grass in woods.
fastibilis, Pers.—Mid. Woods.

(XIX. *FLAMMULA*.)

lentus, Pers.—Mid. (Schwein.) Woods.
spumosus, Fr.—Low. and Mid. In thickets.
flavidus, Schæff.—Low. and Mid. Rotten logs.
inopus, Fr.—Low. and Mid. Rotten logs.
polychrous, Berk.—Low. Rotten logs.
penetrans, Fr.—Low. Rotten logs.
sapineus, Fr.—Low. and Mid. Pine stumps.
picreus, Fr.—Low. and Mid. Damp logs.

(XX. *NAUCORIA*.)

subglobosus, A. & S.—Mid. (Schw.) Pine woods.
cerodes, Fr.?—Mid. (Schw.) Cultivated fields.
argillosus, B. & C.—Low. Woods.
semiorbicularis, Bull.—Common. Woods and fields.
furfuraceus, Pers.—Low. Dead sticks.
conspersus, Pers.—Mid. (Schw.) Damp woods.
siparioides, B. & C.—Low. Exsiccated swamps.
Curcuma, B. & C.—Low. Old stumps.

(XXI. *GALERA*.)

tener, Schæff.—Common. Rich grounds.
Ravenelii, B. & C.—Low. Pine woods.
crocosporus, B. & C.—Low. Decaying vegetable matter.
Hypnorum, Batsch.—Mid. and Up. Among Mosses.

(XXII. *CREPIDOTUS*.)

mollis, Schæff.—Common. Carious wood.

nephrodes, B. & C.—Low. Rotten wood.
variabilis, Pers.—Common. Trunks and dead wood.
elatinus, Pers.—Low. Rotten wood.
depluens, Batsch.—Mid. (Schw.) Earth and wood.
Pecten, B. & C.—Low. Rotten wood.

(XXIII. *PSALLIOTA*.)

campestris, L.—Common. Fields and pastures.
arvensis, Schæff.—Common. Fields and pastures.
amygdalinus, M. A. C.—Common. Rich grounds, woods
 and lanes.
Achimenes, B. & C.—Low. Earth.
cretaceus, Fr.—Common. Earth and wood.
sylvaticus, Schæff.—Low. and Mid. Woods.
echinatus, Roth.—Mid. (Schw.) Cultivated lands.
æruginosus, Curt.—Mid. (Schw.) Earth and wood.
squamosus, Fr.—Low. Pine woods.
stercorarius, Fr.—Low. Manured ground.
semiglobatus, Batsch.—Common. On cow dung.

(XXIV. *HYPHOLOMA*.)

sublateritius, Schæff.—Common. On and around stumps.
epixanthus, Paul.—Low. Burnt places in woods.
fascicularis, Huds.—Common. Rotten wood.
dispersus, Fr.—Low. Earth in Pine woods.
lacrymabundus, Fr.—Low. Earth and trunks.
velutinus, Pers.—Low. Earth and wood.
appendiculatus, Bull.—Low. and Mid. Dried swamps.

(XXV. *PSILOCYBE*.)

Antillarum, Fr.—Low. Stable yards and gardens.
spadiceus, Schæff.—Low. and Mid. Shaded and grassy
 places.
fenisecii, Pers.—Mid. (Schw.) Meadows.
cricæus, Pers.—Mid. (Schw.) Woods and fields.
atrorufus, Schæff.—Mid. (Schw.) Woods and fields.

(XXVI. *PSATHYRA*.)

conopilus, Fr.—Mid. (Schw.) Among Mosses.
obtusatus, Fr.—Low. Woods and swamps.
fagicola, Lasch. ?—Low. Rotten wood.

(XXVII. *PANÆOLUS*.)

- papilionaceus*, Bull.—Com. Pastures and rich grounds.
campanulatus, L.—Common. Rich ground.
separatus, L.—Mid. (Schw.) Among manure.
fimicola, Fr.—Mid. (Schw.) Among manure.

(XXVIII. *PSATHYRELLA*.)

- disseminatus*, Pers.—Low. and Mid. Earth.

- COPRINUS comatus*, Fr.—Low. and Mid. In stable yards.
atramentarius Bull.—Mid. Manured grounds.
finetarius, L.—Mid. (Schw.) Hedge rows, &c.
niveus, Fr.—Low. On cow dung.
tergiversans, Fr.—Low. Earth.
micaceus, Fr.—Mid. About rotten stumps.
radiatus, Bolt.—Mid. (Schw.) Horse dung.
domesticus, Pers.—Mid. (Schw.) In gardens.
ephemerus, Fr.—Low. and Mid. In gardens.
plicatilis, Curt.—Common. Manured grounds.
Spragueii, B. & C.—Mid. Rich grass plats.

- BOLBITIS vitellinus*, Fr.—Mid. (Schwein.) On manure.
titubans, Fr.—Mid. (Schwein.) On manure.

- HIATULA fragilissima*, Rav.—Low. Vegetable matter in rich grounds.

- CORTINARIUS infractus*, Fr.—Mid. (Schw.) Woods.
glaucoopus, Fr.—Mid. (Schw.) Gardens.
callochrous, Fr.—Low. and Mid. Woods & swamps.
cœrulescens, Fr.—Mid. Woods.
turbinatus, Fr.—Mid. (Schwein.) Woods.
rufolivaceus, Fr.—Mid. (Schwein.) Woods.
scæurus, Fr.—Mid. (Schw.) Pine woods.
croceo-cœruleus, Fr.—Mid. (Schw.) Woods.
maculosus, Fr.—Mid. (Schw.) Woods.
subtortus, Fr.—Mid. (Schw.) Woods.
collinitus, Fr.—Mid. (Schw.) Pine woods.
iodes, B. & C.—Low. Mossy ground.
argentatus, Fr.—Mid. (Schw.) Woods.
violaceus, Fr.—Mid. (Schw.) Woods.
violaceo-cinereus, Fr.—Mid. (Schw.) Damp woods.
albo-violaceus, Fr.—Mid. (Schw.) Woods.

- CORTINARIUS** *pholideus*, Fr.—Mid. (Schw.) Dense woods.
sublanatus, Fr.—Mid. (Schw.) Woody hill sides.
ochroleucus, Fr.—Mid. (Schw.) Woods.
decumbens, Fr.—Mid. (Schw.) Grassy woods.
anomalus, Fr.—Mid. (Schw.) Woody hill sides.
sanguineus, Fr.—Common. Damp woods.
cinnamomeus, Fr.—Common. Earth and wood.
 “ var: *croceus*, Fr.—Mid. (Schw.) On
 trunks.
macropus, Fr.—Mid. (Schw.) Pine woods.
bivelus, Fr.—Mid. (Schw.) Woods.
hinnuleus, Fr.—Low. Among leaves in Pine woods.
gentilis, Fr.—Mid. (Schw.) Pine woods.
flexipes, Fr.—Mid. (Schw.) Moist woods.
iliopodius, Fr.—Mid. (Schw.) Woods.
hemitrichus, Fr.—Mid. (Schw.) Among fallen leaves.
armeniaceus, Fr.—(Schw.) Wooded hill sides.
castaneus, Fr.—Common. Earth in woods.
decipiens, Fr.—Mid. (Schw.) Woods.
acutus, Fr.—Mid. (Schw.) Mossy ground.
- PAXILLUS** *involutus*, Fr.—Low. and Mid. Sandy woods.
atro-tomentosus, Fr.—Mid. Pine woods.
flavidus, Berk.—Low. and Mid. Earth in woods.
Pannoides, Fr.—Common. Pine wood.
Curtisii, Berk.—Common. Pine and Fir wood.
reniformis, Berk. and Rav.—Up. (Rav.) Woods.
porosus, Berk.—Low. and Mid. Woods.
- GOMPHIDIUS** *viscidus*, Fr.—Low. Sandy woods.
- HYGROPHORUS** *chrysodon*, Fr.—Mid. (Schwein.) Woods.
eburneus, Fr.—Mid. (Schwein.) Woods.
purpurascens, Fr.—Mid. (Schwein.) Among rotting
 leaves.
erubescens, Fr.—Mid. (Schw.) Springy ground.
discoides, Fr.—Mid. (Schw.) Pine woods.
tephroleucus, Fr.—Mid. (Schw.) Pine woods.
pratensis, Fr.—Mid. (Schw.) Hill sides.
cinnabarinus, Fr.—Common. Damp woods.
Cantharellus, Fr.—Common. Among decayed wood.
laetus, Fr.—Mid. (Schw.) Mossy ground.

HYGROPHORUS *ceraceus*, Fr.—Low. and Mid. Dried swamps.
coccinellus, Fr.—Low. Sandy woods.
luridus, B. & C.—Low. Swamps.
hæmatocephalus, B. & C.—Low. Pine woods.
coccineus, Fr.—Common. Mossy grounds.
miniatus, Fr.—Low. Damp woods and swamps.
mucilaginosis, B. & C.—Low. Swamps.
nitidus, B. & C.—Common. Swamps.
Ravenelii, B. & C.—Low. Wet grounds.
conicus, Fr.—Low. and Mid. Grassy land.
chlorophanus, Fr.—Mid. Among rotting leaves.
psittacinus, Fr.—Mid. (Schw.) Pastures.

LACTARIUS *tormentosus*, Fr.—Low. and Mid. Woods.
turpis, Fr.—Mid. (Schw.) Woods.
insulsus, Fr.—Mid. (Schw.) Woods.
flexuosus, Fr.—Mid. (Schw.) Damp woods.
pergamenus, Fr. ?—Low. Woods.
piperatus, Fr.—Common. Dry woods.
vellereus, Fr.—Common. Dry woods.
deliciosus, Fr.—Low. and Mid. Pine woods.
Indigo, Fr.—Common. Woods.
chrysorheus, Fr.—Common. Swamps.
acris, Fr.—Mid. (Schw.) Woods.
pallidus, Fr.—Mid. (Schw.) Damp woods.
volemus, Fr.—Common. Woods.
subdulcis, Fr.—Common. Damp grounds.
subtomentosus, B. & R.—Common. Swamps.
camphoratus, Fr.—Low. Woods and thickets.
illacrymans, B. & R.—Common. Swamps.
helvus, Fr.—Mid. (Schw.) Woods.
fuliginosus, Fr.—Low. Woods and thickets.

RUSSULA *adusta*, Fr.—Mid. (Schw.) Woods and thickets.
furecata, Fr.—Mid. (Schw.) Woods and thickets.
depallens, Fr.—Mid. (Schw.) Pine woods.
rubra, Fr.—Mid. (Schw.) Woods.
lepida, Fr.—Low. Pine woods.
virescens, Fr.—Mid. (Schw.) Woods.
lactea, Fr.—Mid. (Schw.) Woods.
emetica, Fr.—Common. Woods.

RUSSULA *ochroleuca*, Fr.—Mid. (Schw.) Woody hill sides.
foetens, Fr.—Mid. (Schw.) Woods.
fragilis, Fr.—Mid. (Schw.) Woods.
substiptica, Fr.—Mid. (Schw.) Pine woods.
nitida, Fr.—Mid. (Schw.) Woods.
alutacea, Fr.—Common. Woods.
ochracea, Fr.—Mid. (Schw.) Borders of woods.
lutea, Fr.—Mid. (Schw.) Woods.

CANTHARELLUS *cibarius*, Fr.—Common. Woods.
floccosus, Schw.—Mid. and Up. Woods.
aurantiacus, Wulf.—Mid. (Schw.) Woods.
umbonatus, Fr.—Common. Woods among leaves.
tubæformis, Bull.—Common. Woods among leaves.
lutescens, Bull.—Mid. (Schwein.) Woods among leaves.
cinereus, Fr.—Mid. (Schw.) Woods among leaves.
muscigenus, Bull.—Mid. (Schw.) On Mosses.
crispus, Fr.—Mid. and Up. Dead wood and sticks.
lignatilis, B. & C.—Low. Carious wood.
helosiodes, Schw.—Mid. (Schw.) Rotten sticks.

NYCTALIS *Asterophora*, Fr.—Mid. and Up. Rotten Agarics.

MARASMIUS *oreades*, Fr.—Mid. (Schw.) Hill sides.
plancus, Fr.—Low. Rotten leaves.
spongiosus, B. & C.—Low. and Mid. Rotten leaves.
archyropus, Fr.—Mid. and Up. Rotten leaves.
scorodonius, Fr.—Mid. (Schw.) Decaying vegetation.
calopus, Fr.—Mid. (Schw.) Dead sticks.
Vaillantii, Fr.—Low. and Mid. On trunks.
clavæformis, Fr.—Mid. On dead plants.
ramealis, Fr.—Common. Dead leaves and sticks.
opacus, B. & C.—Low. Dead leaves and sticks.
siccus, Fr.—Mid. and Up. Earth among leaves.
hæmatocephalus, Mont.—Com. Earth, leaves, sticks, &c.
brevipes, B. & R.—Up. (Rav.) Dead twigs.
alliaceus, Fr.—Low. and Mid. Woods.
nigripes, Fr.—Mid. (Schw.) Fallen leaves.
androsaceus, Fr.—Mid. (Schw.) Among Mosses.
rotula, Fr.—Common. Dead sticks.
similis, B. & C.—Low. Earth.

- MARASMIUS** *Graminum*, Berk.—Low. Dead grass, herbs, &c.
pithyophilus, B. & C.—Low. Dead Pine leaves.
perforans, Fr.—Mid. (Schw.) Dead Fir leaves.
insititius, Fr.—Up. On fallen leaves.
pruinatus, B. & C.—Low. Dead bark and wood.
pusio, B. & C.—Low. Trunks.
dichrous, B. & C.—Low. Fallen limbs.
velutipes, B. & C.—Low. Rotting leaves in swamps.
epiphyllus, Fr.—Mid. (Schw.) Fallen leaves.
- LENTINUS** *Schweinitzii*, Fr.—Mid. (Schw.) Sides of trunks.
Lecointei, Fr.—Common. Logs and stumps.
strigosus, Fr.—Mid. (Schw.) Trunks of Tulip tree.
tener, Kl.—Low. Dead wood in swamps.
tigrinus, Fr.—Common. Logs and stumps.
Ravenelii, B. & C.—Common. Dead wood.
lepidus, Fr.—Common. Stumps.
cochleatus, Fr.—Mid. (Schw.) Dead wood.
friabilis, Fr.—Mid. (Schw.) Side of trunks.
chama, Fr.—Mid. (Schw.) Oak trunks.
flabelliformis, Fr.—Mid. (Schw.) Dead trunks.
pellienosus, Fr.—Mid. (Schw.) Dead trunks.
Micheneri, B. & C.—Up. Dead wood.
pectinatus, Fr.—Mid. (Schw.) Side of trunks.
tenuissimus, Fr.—Mid. (Schw.) Bark of Willows.
- PAXUS** *conchatus*, Fr.—Mid. and Up. Dead trunks.
torulosus, Fr.—Mid. and Up. Stumps.
levis, B. & C.—Low. and Mid. Trunks and logs.
foetens, Secr.—Low. Dead wood.
dorsalis, Fr.—Low. and Mid. Pine stumps and logs.
stypticus, Fr.—Common. Dead wood.
dealbatus, Berk.—Up. Dead wood.
angustatus, Berk.—Mid. (Schw.) Dead wood.
- XEROTUS** *nigrita*, Lev.—Mid. and Up. Dead wood.
- SCHIZOPHYLLUM** *commune*, Fr.—Common. Dead wood.
- LENZITES** *betulina*, Fr.—Common. Logs and stumps.
Berkeleyi, Lev.—Common. Logs and stumps.
trabea, Fr.—Mid. (Schw.) On wood.
striata, Fr.—Common. On wood.
abietina, Fr.—Common. Old posts and rails.

- sepiaria*, Fr.—Common. Old posts and rails.
LENZITES *rhabarbarina*, B. & C.—Low. Trunks.
tricolor, Fr.—Low. Dead limbs.
Klotschii, Berk.—Common. Trunks and logs.
Crataegi, Berk.—Common. Trunks and limbs.
variegata, Fr.—Mid. (Schw.) Trunks and limbs.
BOLETUS *luteus*, L.—Mid. (Schw.) Pine woods.
elegans, Fr.—Low. Earth in woods.
Curtisii, Berk.—Low. Earth in woods.
flavidus, Fr.—Common. Damp woods.
collinitus, Fr.—Mid. and Up. Pine woods.
granulatus, L.—Common. Woods and fields.
bovinus, L.—Common. Pine woods.
decipiens, B. & C.—Low. Damp woods.
piperatus, Bull.—Low. and Mid. Woods.
lacticolor, B. & C.—Mid. Woods.
Betula, Schw.—Mid. Ligneous earth.
variegatus, Fr.—Mid. Sphagnous grounds.
chrysenteron, Bull.—Mid. and Up. Damp woods and fields.
subtomentosus, L.—Common. Earth in woods.
hemichrysus, B. & C.—Low. Base of Pines.
rubiginosus, Retz.—Mid. Woods.
calopus, Fr.—Mid. (Schw.) Woods.
pachypus, Fr.—Low. Woods.
retipes, B. & C.—Mid. Woods.
Satanas, Lenz.—Mid. Woods.
purpureus, Fr.—Mid. Woods.
luridus, Schæff.—Mid. (Schw.) Woods.
edulis, Bull.—Mid. (Schw.) Woods.
versipellis, Fr.—Mid. Woods.
scaber, Bull.—Low. and Mid. Sandy woods.
fellens, Bull.—Low. and Mid. Banks and thickets.
castaneus, Bull.—Mid. (Schw.) Woods.
strobilaceus, Scop.—Common. Woods and thickets.
albo-ater, Schw.—Mid. (Schw.) Moist woods.
Ananas, M. A. C.—Low. Under Pine logs.

POLYPORUS (I. MESOPUS.)

- leucomelas*, Fr.—Mid. Woods.
ovinus, Schæff.—Low. and Mid. Earth in woods.
poripes, Fr.—Mid. and Up. Wooded ravines.
areularius, Fr.—Mid. and Up. Dead sticks.
brumalis, Fr.—Low. and Mid. Dead sticks.
ciliatus, Fr.—Mid. (Schw.) Dead sticks.
Schweinitzii, Fr.—Mid. Pine woods.
tabulaeformis, Berk.—Low. Earth in Pine woods.
persicinus, B. & C.—Low. In swamps.
dependens, B. & C.—Low. Under Pine logs.
rufescens, Fr.—Common. Carious wood.
tomentosus, Fr.—Low. Base of Pines.
perennis, Fr.—Common. Earth in woods.
parvulus, Kl.—Low. and Mid. Burnt places in woods.

(II. PLEUROPUS.)

- Boucheanus*, Fr.—Low. and Mid. On sticks.
 “ var: *peponinus*, B. & C.—Low. On sticks.
melanopus, Fr.—Mid. and Up. On sticks.
varius, Fr.—Mid. and Up. Trunks and limbs.
elegans, Fr.—Up. Earth.
lucidus, Fr.—Common. Buried roots.
Curtisii, Berk.—Common. Buried roots.
dealbatus, B. & C.—Low. Buried wood.
mutabilis, B. & C.—Com. Stumps and sticks in swamps.
hippidius, Berk.—Common. Dead limbs.
sanguineus, Fr.—Common. On logs.

(III. MERISMA.)

- frondosus*, Fr.—Common. Earth and base of stumps.
cristatus, Fr.—Mid. (Schw.) Pine woods.
confluens, Fr.—Low. and Mid. Pine woods.
giganteus, Fr.—Low. and Mid. Base of stumps.
lobatus, Fr.—Low. Base of stumps.
sulphureus, Fr.—Common. Trunks and logs.
Berkelcii, Fr.—Mid. and Up. Woods.
distortus, Schw.—Low. and Mid. Clayey banks.
graveolens, Schw.—Common. On trunks.

(IV. APUS.)

- epileucus*, Fr.—Common. Dead trunks and limbs.
fissilis, B. & C.—Low. Stumps.
stypticus, Fr.—Mid. (Schw.) Pine woods.
lacteus, Fr.—Common. Trunks and stumps.
mollis, Fr.—Mid. (Schw.) On sticks.
cæsius, Fr.—Mid. (Schw.) On sticks.
destructor, Fr.—Mid. (Schw.) Wood and logs.
Aesculi, Fr.—Up. (Schw.) Trunk of Buckeye.
gilvus, Fr.—Common. Trunks and limbs.
adustus, Fr.—Common. Trunks and limbs.
crispus, Fr.—Mid. and Up. (Schw.) Chestnut Trunks.
isabellinus, Fr.—Mid. (Schw.) On trunks.
unicolor, Fr.—Low. and Mid. On trunks.
Pilotæ, Schw.—Mid. and Up. (Schw.) Chestnut trunks.
hispidus, Fr.—Common. Trunks.
labyrinthicus, Fr.—Mid. (Schw.) Trunks.
scarrosus, B. & C.—Low. Log of Tulip tree.
borealis, Fr.—Low. Logs.
cerifluus, B. & C.—Low. Decaying logs.
undulatus, Fr.—Mid. (Schw.) Trunks.
Symphyton, Fr.—Mid. (Schw.) Fallen limbs.
dryophilus, Berk.—Low. Oak (?) trunks.
resinosus, Fr.—Common. On logs.
palustris, B. & C.—Low. Pine trunk.
pallesceus, Fr.—Mid. and Up. Trunks and limbs.
conchifer, Schw.—Mid. and Up. Dead limbs.
spissus, Fr.—Low. and Mid. Trunks.
applanatus, Fr.—Mid. and Up. Trunks and logs.
fomentarius, Fr.—Common. Trunks and limbs.
cupulæformis, B. & C.—Common. Bark of Walnut, Sumach, &c.
igniarius, Fr.—Common. Trunks and limbs.
senex, Mont.—Low. and Mid. Trunks.
conchatus, Fr.—Low. and Mid. Logs.
citrinellus, B. & C.—Mid. (Schw.) Trunks.
salicinus, Fr.—Common. Logs and limbs.
scutellatus, Schw.—Mid. and Up. Bark of limbs, &c.
pinicola, Fr.—Mid. (Schw.) Pine trunks.

marginatus, Fr.—Mid. (Schw.) Beech trunks.
carneus, Nees.—Common. Posts and logs.
annosus, Fr.—Common. Logs and wood.
cinnabarinus, Fr.—Common. Logs and limbs.
seruposus, Fr.—Common. Stumps and logs.
radiatus, Fr.—Up. Trunks.
cervinus, Fr.—Mid. (Schw.) Bark of Peach tree.
biformis, Kl.—Low. and Mid. Stumps, logs, sticks, &c.
undatus, Fr.—Up. Logs.
hirsutus, Fr.—Common. Trunks and limbs.
hirsutulus, Schw.—Low. and Mid. Dead limbs.
zonatus, Fr.—Mid. (Schw.) Dead wood.
versicolor, Fr.—Common. Trunks, limbs, &c.
decipiens, Schw.—Common. Trunks, limbs, &c.
zonalis, Berk.—Low. Trunks, limbs, &c.
abietinus, Fr.—Common. Pine and Fir limbs.
deglubens, B. & C.—Low. Dead Pine limbs.
dendriticus, Fr.—Low. Cypress stumps.
chartaceus, B. & C.—Mid. Trunk and limbs of Tulip tree.
velutinus, Fr.—Mid. Carious wood.
Sullivantii, Mont.—Common. Limbs.
pergameneus, Fr.—Common. Logs and limbs.
elongatus, Berk.—Low. Stumps and sticks.
cinerascens, Fr.—Mid. (Schw.) On wood.
virginens, Schw.—Mid. and Up. Dead limbs.
Nilgerrhensis, Mont.—Mid. Logs.
Floridanus, Berk.—Low. Logs and limbs.
barbulatus, Fr.—Low. Bark of Cedar and Cypress.

(V. RESUPINATUS.)

obliquus, Fr.—Mid. and Up. Logs and trunks.
Viticola, Fr.—Mid. Grape vines.
contiguus, Fr.—Common. Dead sticks.
ferruginosus, Schrad.—Common. Dead limbs.
occidentalis, Kl.—Low. Logs.
niger, Berk.—Common. Carious wood.
xanthus, Fr.—Low. and Up. Under Pine wood.
nitidus, Fr. ?—Low. Bark of Tulip Tree.
pulehellus, Schw.—Low. and Mid. Underside of log.
aureolus, Grev.—Low. Pine wood.

fuscocarneus, Pers.—Low. Trunks.
crociaporus, B. & C.—Mid. (Schw.) Oak trunks.
vitellinus, Fr.—Mid. (Schw.) Dead wood.
incarnatus, Fr.—Common. Bark and wood:
purpureus, Fr.—Mid. (Schw.) Wood.
medulla-panis, Fr.—Common. Wood.
mucidos, Fr.—Common. Wood.
callosus, Fr.—Low. Carious wood.
vulgaris, Fr.—Common. Carious wood.
Cremor, B. & C.—Low. Fallen limbs.
Stephensii, Berk.—Low. and Up. Dead limbs.
xantholoma, Schw.—Mid. (Schw.) Dead wood.
limitatus, B. & C.—Low. Dead wood.
nigropurpureus, Fr.—Mid. (Schw.) Under logs.
salmonicolor, B. & C.—Common. Carious wood.
Juglandinus, Fr.—Mid. (Schw.) On Walnut and Sycamore.
molluscus, Pers.—Low. On sticks.
sanguinolentus, A. & S.—Low. On mosses.
oxydatus, B. & C.—Low. Rotten wood.
sinuosus, Fr.—Low. Dead sticks.
vaporarius, Fr.—Common. Wood and bark.
aneirinus, Fr.—Low. Carious wood.
Vaillantii, Fr.—Up. (Rav.) Logs.
farinellus, Fr.—Common. Carious wood and bark.
reticulatus, Fr.—Mid. (Schw.) Wood.

TRAMETES *sepium*, Berk.—Common. Dead wood.
lactea, Berk.—Up. Stumps.
rigida, Berk.—Low. Logs.
rubescens, Fr.—Mid. (Schw.) On Willows.
Pini, Fr.—Low. Pine trunks.

DÆDALEA *glaberrima*, B. & C.—Low. On logs.
subtomentosa, Schw.—Mid. (Schw.) Trunks.
aurea, Fr.—Low. and Mid. Oak trunks.
cinerea, Fr. ?—Mid. and Up. Trunks.
unicolor, Fr. ?—Common. Stumps and logs.
zonata, Schw.—Mid. (Schw.) Trunks.

HEXAGONA *carbonaria*, B. & C.—Low. On burnt logs.
GLÆOPORUS *nigropurpurascens*, (Schw.)—Com. Logs and trunks.

amorphus, (Fr.)—Low. and Mid. Logs and trunks.

- MERULIUS** *incarnatus*, Schw.—Common. Rotting logs.
confluens, Schw.—Mid. (Schw.) Dead Alders, &c.
tremellosus, Schrad.—Common. Rotten logs.
incrassatus, B. & C.—Low. Carious Pine stump.
Corium, Fr.—Common. Sticks and logs.
ceracellus, B. & C.—Low. Dead Oak limbs.
molluscus, Fr.—Mid. (Schw.) Wood.
fugax, Fr.—Low. Pine limbs.
Porinoides, Fr.—Common. Under Pine wood.
rufus, Pers.—Mid. (Schw.) Trunks.
serpens, Fr.—Low. and Mid. Pine trunks and limbs.
Brassicæfolius, Schw.—Low. and Mid. Damp wood,
 walls, &c.

lacrymans, Schum.—Mid. (Schw.) In cellars.

- POROTHELIUM** *fimbriatum*, Fr.—Common. Carious wood.
lacerum, Fr.—Common. Wood and sticks.
subtile, Fr.—Common. Bark and wood.

- ARRHYTIDIA** *flava*, B. & C.—Low. Pine bark and wood.
fulva, B. & C.—Low. Underside of Pine logs.

- FISTULINA** *hepatica*, Fr.—Up. Base of trunks and stumps.
radicata, Fr.—Mid. (Schw.) Hollow trunks.

HYDNUM (I. MESOPUS.)

- imbricatum*, L.—Mid. and Up. Earth in woods.
subsquamosum, Batsch.—Common. Damp woods.
levigatum, Swartz.—Low. Pine woods.
canum, Schw.—Mid. (Schw.) Mossy banks.
repandum, L.—Common. Woods.
rufescens, Schæff.—Mid. (Schw.) Woods.
compactum, Fr.—Low. and Mid. Woods.
aurantiacum, A. & S.—Mid. and Up. Hill sides.
ferrugineum, Fr.—Low. Pine woods.
spadicum, Pers.—Mid. (Schw.) Pine woods.
velutinum, Fr.—Mid. Woods.
zonatum, Batsch.—Common. Woods.
graveolens, Delast.—Common. Base of stumps.
tomentosum, L.—Mid. (Schw.) Woods.

(II. PLEUROPUS.)

adustum, Schw.—Mid. and Up. On sticks.

(III. MERISMA.)

coralloides, Scop.—Common. Side of trunks.

ramosum, Schw.—Mid. (Schw.) On wood.

Erinacens, Bull.—Common. Base of trunks.

Caput-Medusæ, Bull.—Common. Trunks and logs.

(IV. APS.)

gelatinosum, Scop.—Common. Trunks and logs.

cirrhatum, Pers.—Common. Logs.

pulcherrimum, B. & C.—Low. Stumps and logs.

amblyodon, M. A. C.—Mid. On wood.

strigosum, Swartz.—Mid. (Schw.) Trunks.

Rhois, Schw.—Common. Stumps and sticks.

læticolor, B. & C.—Low. Fallen limbs.

ochraceum, Pers.—Common. Sticks, stumps, &c.

(V. RESUPINATUS.)

fuscoatrum, Fr.—Common. Wood and sticks.

membranaceum, Bull.—Common. Wood and sticks.

ferruginosum, Schrad.—Common. Wood and bark.

croceum, Fr.—Mid. (Schw.) Wood.

sulfureum, Schw.—Mid. (Schw.) Dead limbs.

fragillimum, B. & C.—Low. Under rotten logs.

alutaceum, Fr.—Mid. Carious wood.

spatulatum, Fr.—Mid. (Schw.) Carious wood.

viride, Fr.—Mid. (Schw.) Rotting trunks.

udum, Fr.—Low. and Mid. Carious wood.

Himantia, Schw.—Mid. Carious wood.

mucidum, Pers.—Low. Trunks and wood.

diaphanum, Schrad.—Mid. (Schw.) Logs and leaves.

farinaceum, Pers.—Common. On wood.

fasciculare, A. & S.—Mid. (Schw.) Pine logs.

chrysodon, B. & C.—Low. On Oak chips.

Fascicularia, B. & C.—Low. Carious wood and bark.

velatum, B. & C.—Low. Underside carious wood.

ciliolatum, B. & C.—Low. Fallen limbs.

plumosum, Duby.—Low. Wood and bark.

caryophyllæum, B. & C.—Low. Carious wood.
 xanthum, B. & C.—Low. and Up. Fallen limbs.
 pithyophilum, B. & C.—Low. Pine wood.
 plumarium, B. & C.—Low. On dead Viburnum.?
 Nyssæ, B. & C.—Low. Log of Black Gum.
 depauperatum, B. & C.—Low. Carious wood.
 nudum, B. & C.—Common. Rotten wood, &c.

HERICIUM *Hystrix*, Fr.—Low. Base of trees.

SISTOTREMA *confluens*, Pers.—Mid. (Schw.) Woods.

occarium, Fr.—Mid. (Schw.) Trunks.

IRPEX *pendulus*, Fr.—Low. Pine stumps.

fusco-violaceus, Fr.—Mid. (Schw.) Cedar and Pine trunks.

sinuosus, Fr.—Common. Stumps, limbs, &c.

palleseens, Fr.—Mid. (Schw.) Trunk of Tulip Tree.

crassus, B. & C.—Mid. Oak trunks.

mollis, B. & C.—Low. and Mid. Trunks and stumps.

tabacinus, B. & C.—Low. and Mid. Bark of White and
 Post Oaks.

Schweinitzii, B. & C.—Mid. and Up. Dead limbs.

paradoxus, Schrad.—Mid. (Schw.) On Birch and Cherry.

cinerascens, Schw.—Mid. (Schw.) Side of trunks.

obliquus, Fr.—Low. and Mid. On Sweet Gum.

Tulipiferae, Schw.—Mid. (Schw.) On Tulip Tree.

deformis, Fr.—Mid. (Schw.) Trunks.

cinnamomeus, Fr.—Common. Trunks and limbs.

carneus, Fr.—Mid. (Schw.) On bark.

RADULUM *molare*, Fr.—Common. Dead limbs.

pallidum, B. & C.—Low. Sticks.

lætum, Fr.—Common. Branches.

fagineum, Fr.—Mid. (Schw.) Wood of limbs.

PILEA *Merismoides*, Fr.—Common. Dead limbs.

zonata, B. & C.—Low. and Up. Wood and limbs.

reflexa, B. & C.—Low. Oak limbs.

radiata, Fr.—Common. Limbs and logs.

orbicularis, B. & C.—Low. Fallen Oak limbs.

vaga, Fr.—Low. and Mid. Rotten logs.

GRANDINIA *granulosa*, Fr.—Common. Carious wood.

ODONTIA *fimbriata*, Fr.—Common. Fallen limbs.

lateritia, B. & C.—Up. Carious wood.

Sistotremoides, Fr.—Mid. (Schw.) On wood.

KNEIFFIA setigera, Fr.—Common. On wood.

candidissima, B. & C.—Com. Bark of Cedar and Grape.

tessulata, B. & C.—Low. Carious wood.

CRATERELLUS odoratus, Fr.—Low. and Mid. Earth in woods.

lutescens, Fr.—Low. Earth and rotten wood.

cornucopioides, Pers.—Common. Woods.

roseus, Fr.—Mid. (Schw.) Mossy banks.

Cantharellus, Fr.—Mid. (Schw.) Earth in woods.

THELEPHORA (I. MESOPUS.)

regularis, Schw.—Mid. (Schw.) Mossy banks.

pannosa, Fr.?—Mid. (Schw.) Earth.

vialis, Schw.—Common. Woods and road sides.

tephroleuca, B. & C.—Mid. and Up. Woods.

tuberosa, Fr.—Mid. (Schw.) Earth.

anthocephala, Bull.—Common. Woods.

caryophyllæa, Fr.—Common. Woods.

multipartita, Schw.—Mid. (Schw.) Earth.

(II. MERISMA.)

Cladonia, Fr.—Mid. and Up. Woods.

palmata, Fr.—Common. Earth in woods.

pallida, Schw.—Common. Earth in woods.

candida, Fr.—Mid. (Schw.) Earth in woods.

terrestris, Ehrh.—Mid. and Up. Earth in woods.

gausapata, Fr.—Mid. (Schw.) Trunks.

lutosa, Schw.—Mid. (Schw.) Roadsides.

(III. APUS.)

fimbriata, Fr.—Mid. (Schw.) Earth.

spiculosa, Fr.—Mid. (Schw.) Pine woods.

laciniata, Pers.—Common. Earth and trunks.

biennis, Fr.—Mid. and Up. Earth and trunks.

cuticularis, Berk.—Mid. and Up. Earth and trunks.

frondescens, Fr.—Mid. (Schw.) Earth.

(IV. RESUPINATUS.)

Helvelloides, Schw.—Mid. (Schw.) Earth.

spongiosa, Schw.—Mid. (Schw.) Mossy rocks.

galactina, Fr.—Low. Side of ditches.

sebacea, Fr.—Common. Leaves, grass, &c.

stabularis, Fr.—Mid. (Schw.) Stable manure.
 umbrina, Fr.—Mid. and Up. Under logs and sticks.
 arida, Fr.—Low. On Pine wood.
 terrea, B. & C.—Low. Under prostrate Pine wood.
 granosa, B. & C.—Common. Rotten logs.
 ferruginea, Pers.—Mid. (Schw.) Fallen branches.
 anthochroa, Pers.—Mid. (Schw.) Leaves and sticks.
 mollis, Fr.—Mid. (Schw.) Pine wood.
 pedicellata, Schw.—Common. On living branches.
 fusca, Fr.—Mid. (Schw.) Bark of trunks.
 bufonia, Pers.—Mid. (Schw.) Limbs of Sweet Gum.

STEREUM (I. MESOPUS.)

calyculus, B. & C.—Low. Moist woods.
 tenerrimum, B. & R.—Low. Among Mosses.

(II. APUS.)

fasciatum, Fr.—Common. Trunks and limbs.
 lobatum, Kze.—Common. Trunks and limbs.
 versicolor, Swartz.—Low. Fallen limbs.
 striatum, Fr.—Common. Dead limbs.
 porrectum, Fr.—Mid. (Schw.) Dead limbs.
 complicatum, Fr.—Common. Dead limbs.
 purpureum, Pers.—Common. Trunks and stumps.
 spadiceum, Fr.—Common. Trunks and stumps.
 molle, Lev.—Mid. Logs.
 hirsutum, Fr.—Common. Limbs and logs.
 styracifluum, Schw.—Mid. (Schw.) On Sweet Gum.
 sanguinolentum, A. & S.—Low. and Mid. Pine trunks.
 ochraceo-flavum, Schw.—Common. On limbs.
 bicolor, Fr.—Common. Logs and limbs.
 Micheneri, B. & C.—Mid. and Up. Fallen limbs.
 ferrugineum, Fr.—Mid. (Schw.) Fallen limbs.
 rubiginosum, Schrad.—Common. Trunks and sticks.
 papyrinum, Mont.—Low. Decaying logs.
 tabacinum, Fr.—Mid. and Up. (Schw.) Fallen limbs.
 cervinum, B. & C.—Low. Fallen Oak limbs.
 imbricatum, Schw.—Common. Trunks and branches.
 Curtisii, Berk.—Common. Bark of White and Post Oaks.
 Leveilleanum, B. & C.—Low. and Mid. Dead limbs.

albobadium, Schw.—Low. and Mid. Trunks and branches.
 candidum, Schw.—Low. and Mid. Bark of trees.
 frustulosum, Fr.—Low. and Mid. Wood and stumps.
 subpileatum, B. & C.—Common. Logs and stumps.
 rugosum, Fr.—Mid. and Up. Trunks and logs.
 Pini, Fr.—Mid. (Schw.) Pine bark.
 ulneum, Fr.—Mid. (Schw.) On wood.
 acerinum, Fr.—Common. Bark of trees.

AURICULARIA mesenterica, Bull.—Mid. (Schw.) Trunks.

CORTICIUM (I. APUS.)

ochroleucum, Fr.—Low. and Up.? Fallen limbs,
 subzonatum, Fr.—Mid. (Schw.) Wood.
 evolvens, Fr.—Low. and Mid. On bark of trees.
 salicinum, Fr.—Mid. (Schw.) On Willows.
 Oakesii, B. & C.—Up. Bark of White Oak,

(II. HIMANTIA.)

giganteum, Fr.—Common. Bark and wood.
 læve, Fr.—Common. Bark and wood.
 Auberianum, Mont.—Common. Bark and wood.
 roseum, Fr.—Mid. (Schw.) Bark of trunks.
 velutinum, Fr.—Bark of Sweet Gum.
 glabrum, B. & C.—Low. Sticks in wet ground.
 sulfureum, Fr.—Mid. and Up. Wood, bark, &c.
 Viticola, Fr.—Mid. and Up. Bark of Grape vines.
 alutaceum, B. & C.—Mid. (Schw.) Carious wood.
 cœrnuleum, Fr.—Common. Wood and bark.
 atrovirens, Fr.—Mid. (Schw.) Carious wood.
 arachnoideum, Berk.—Common. Wood and bark.
 polyschistum, B. & C.—Low. Branches of Apple tree.
 leucothrix, B. & C.—Low. Underside of Pine wood,

(III. LEOSTROMA.)

calceum, Fr.—Common. Wood and bark.
 Rubicola, B. & C.—Common. Blackberry stalks,
 viscosum, Pers.—Mid. (Schw.) Putrid wood.
 Martianum, B. & C.—Up. Putrid wood.
 molle, B. & C.—Low. Putrid wood.
 œhraceum, Fr.—Mid. (Schw.) Wood.
 seriale, Fr.?—Mid. (Schw.) Pine wood.

quercinum, Pers.—Mid. and Up. Bark of Chestnut, &c.
albido-carneum, (Schw.)—Common. Carious wood.
cinereum, Fr.—Common. Bark of limbs.
scutellatum, B. & C.—Common. Bark of limbs.
incarnatum, Fr.—Common. Wood and bark.
polygonium, Pers.—Mid. (Schw.) Dead limbs.
corrugatum, Fr.—Common. Bark and wood.
Sambuci, Pers.—Mid. (Schw.) On Elder.
episphæria, (Schw.)—Mid. (Schw.) On wood and Hypox:
 stigma.

GUEPINIA *Spathularia*, Fr.—Common. Pine wood.
elegans, B. & C.—Low. and Up. Trunks and logs.

CYPHELLA *lacera*, Fr.—Mid. (Schw.) On vegetable matter.
Filicicola, B. & C.—Low. Stem of Ferns.
Capula, Fr.—Common. Stems of herbs.
fulva, B. & R.—Common. Branches of Alder.

SPARASSIS *crispa*, Fr.—Up. Earth.
laminosa, Fr.—Low. Oak log.
spathulata, Fr.—Low. and Mid. Earth.

CLAVARIA (I. **RAMARIA**.)

flava, Fr.—Common. Earth in woods.
Botrytis, Pers.—Common. Earth in woods.
fastigiata, L.—Mid. (Schw.) Grassy places.
muscoïdes, L.—Mid. (Schw.) Grassy places.
tetragona, Schw.—Mid. (Schw.) Damp woods.
cristata, Holmsk.—Mid. and Up. Damp woods.
rugosa, Bull.—Mid. (Schw.) Damp woods.
fuliginea, Pers.—Low. and Mid. Shady woods.
macropus, Pers.—Mid. (Schw.) Earth.
subtilis, Pers.—Mid. (Schw.) Shaded banks.
pyxidata, Pers.—Common. Rotten wood.
aurca, Schæff.—Common. Earth in woods.
formosa, Pers.—Common. Earth in woods.
abietina, Schum.—Mid. (Schw.) Ligneous Earth.
leucotopha, B. & C.—Mid. (Schw.) Among rotting
 leaves.
grisea, Pers.—Mid. (Schw.) Woods.
gracilis, Pers.—Mid. (Schw.) Shady banks.

stricta, Pers.—Common. Wood and earth.
byssiseda, Pers.—Mid. (Schw.) Rotting leaves.

(II. SYNCORYNE.)

inaequalis, Fr.—Common. Damp woods.
fusiformis, Sow.—Common. Fields and woods.
argillacea, Fr.—Mid. (Schw.) Fields and woods.
vermiculata, Scop.—Mid. (Schw.) Grassy fields.
fragilis, Holmsk.—Common. Earth in woods.
tenacella, Pers.—Mid. (Schw.) Woods.
fumosa, Pers.—Mid. (Schw.) Pine woods.

(III. HOLOCORYNE.)

pistillaris, L.—Mid. (Schw.) Shady woods.
ligula, Fr.—Mid. (Schw.) Among shrubs.
contorta, Fr.—Up. On sticks.
falcata, Pers.—Mid. and Up. Mossy places.
vernalis, Schw.—Mid. (Schw.) Naked earth.
innocida, Pers.—Common. Damp rotting wood.
acuta, Sow.—Low. Mossy banks.
? trichomorpha, Schw.—Mid. (Schw.) Dead Corn stalks.

CALOCERA viscosa, Fr.—Mid. (Schw.) Pine woods.
palmata, Fr.—Common. Carious wood.
fureata, Fr.—Mid. (Schw.) Trunks.
cornea, Fr.—Common. Bark and wood.
pilipes, Schw.—Mid. (Schw.) On wood.

CRINULA paradoxa, B. & C.—Low. On Oak leaves.

TYPHULA tennissima, M. A. C.—Low. Rotting leaves.
Grevillei, Fr.—Low. Fruit and leaf stalks of Sweet Gum.
gyrans, Fr.—Mid. (Schw.) Stems of herbs.
mucosa, B. & C.—Low. Stems of herbs.

PISTILLARIA Muscicola, Fr.—Mid. and Up. On Mosses.
rosella, Fr.—Low. Rotting leaves.
elegans, B. & C.—Low. Dead twigs of Snow Ball.
micans, Fr.—Mid. (Schw.) Stems of herbs.
ovata, Fr.—Mid. (Schw.) Dead leaves.

TREMELLA foliacea, Pers.—Common. Trunks, logs, &c.
aurantia, Schw.—Common. Trunks, logs, &c.
intescens, Fr.—Common. Trunks, logs, &c.
vesicaria, Bull.—Mid. (Schw.) Stems of plants.

- mesenterica*, Retz.—Common. On bark.
intumescens, Sm.—Common. Wood and limbs.
albida, Huds.—Common. Wood and limbs.
virens, Schw.—Mid. (Schw.) On Dogwood limbs.
enata, B. & C.—Low. Oak limbs.
sarcoides, With.—Mid. and Up. Trunks and branches.
parasitica, Schw.—Mid. (Schw.) On *Lentinus tigrinus*.

CORYNE *gyrocephala*, B. & C.—Low. Wet rotten wood.

EXIDIA *Auricula-Judæ*, Fr.—Common. Trunks.

auriformis, Fr.—Mid. (Schw.) On wood.

recisa, Fr.—Low. Fallen limbs.

pedunculata, B. & C.—Low. Pine wood.

glandulosa, Fr.—Common. Limbs and sticks.

crenata, Fr.—Mid. (Schw.) On limbs.

NÆMATELIA *encephala*, Fr.—Mid. and Up. Fallen limbs.

nucleata, Fr.—Common. Fallen limbs.

DACRYMYCES *fragiformis*, Nees.—Mid. (Schw.) On *Hypoxylon stigma*.

moriformis, Fr.—Low. Wood and bark.

violaceus, Fr.—Mid. (Schw.) Branch of Apple tree.

stillatus, Fr.—Common. Pine wood.

tortus, Fr.—Common. Pine wood.

deliquescens, Duby.—Up. Dead limbs.

lacrymalis, Pers.—Mid. (Schw.) On wood.

involutus, Schw.—Mid. (Schw.) Old wood.

pellucidus, Schw.—Mid. (Schw.) Wood.

Syringæ, Fr.—Low. and Mid. Dead bark of Lilac.

epiphyllus, Schw.—Mid. (Schw.) Leaf of Galium.

HYMENULA *Phytolacæ*, B. & C.—Mid. Dead stem of Poke weed.

AGYRIUM *nigricans*, Fr.?—Low. Dry wood.

II. GASTEROMYCETES.



CAULOGLOSSUM transversale, Fr.—Low. and Mid. Earth in damp woods.

HYDNANGIUM Ravenelii, B. & C.—Low. Swampy ground.

RHIZOPOGON luteolus, Tul.—Mid. Swampy ground.

rubescens, Tul.—Low. and Mid. Swampy ground.

MELANOGASTER rubescens, Tul.—Up. Swampy ground.

PHALLUS duplicatus, Bosc.—Common. Earth in Pine woods.

indusiatus, Vent.—Mid. (Schw.) Earth.

impudicus, L.—Mid. Earth.

rubicundus, Fr.—Low. Earth.

CORYNITES brevis, B. & C.—Low. and Mid. Fields and Gardens.

CLATHRUS columnatus, Bosc.—Low. and Mid. Sandy woods.

TULOSTOMA fimbriatum, Fr.—Common. In light soils.

mammosum, Fr.—Common. In ligneous earth.

LYCOPERDON Bovista, L.—Common. Grassy land.

candidum, Schw.—Mid. (Schw.) Grassy woods.

coelatum, Bull.—Low. and Mid. Earth and stumps.

pusillum, Batsch.—Low. and Mid. Loose soil.

aeuminatum, B. & C.—Low. and Mid. On Mosses.

gemmatum, Batsch.—Common. Woods and fields.

pyriforme, Schæffl.—Common. Earth and rotten logs.

BOVISTA nigrescens, Pers.—Common. Grassy fields.

plumbea, Pers.—Common. Grassy fields.

cyathiformis, (Bosc.)—Common. Fields and banks.

GEASTER fornicatus, Fr.—Common. Earth in woods.

minimus, Schw.—Common. Earth in woods.

limbatus, Fr.—Up. Woods.

fimbriatus, Fr.—Low. Sandy woods.

saccatus, Fr.—Common. Earth.

rufescens, Pers.—Mid. (Schw.) Hill-sides.

hygrometricus, Pers.—Common. Earth.

fibrillosus, Schw.—Mid. (Schw.) Naked Earth.

SCLERODERMA Geaster, Fr.—Common. Clayey banks.

vulgare, Fr.—Common. Earth.

Texense, Berk.—Low. Sandy woods.

Bovista, Fr.—Low. Sandy woods.

Lycoperdioides, Schw.—Mid. (Schw.) Logs and
ligneous earth.

POLYSACCUM Pisocarpium, Fr.—Low. Base of stumps, &c.

ARACHNION album, Schw.—Low. and Mid. Earth.

MITREMYCES lutescens, Schw.—Common. Damp woods.

cinnabarinum, Schw.?—Low. Damp woods.

Ravenelii, Berk.—Up. Earth.

LYCOGALA epidendrum, L.—Common. Rotten wood.

RETICULARIA umbrina, Fr.—Mid. (Schw.) Rotten trunks.

atra, Fr.—Mid. (Schw.) Pine wood.

Muscorum, Fr.—Mid. (Schw.) On Mosses.

ÆTHALIUM septicum, Fr.—Common. On wood, stumps, &c.

Ferrincola, Schw.—Mid. (Schw.) On a piece of iron.

DIDERMA stellare, Pers.—Low. Pine wood.

floriforme, Pers.—Mid. (Schw.) On trunks.

globosum, Pers.—Mid. (Schw.) Leaves.

difforme, Sommerf.—Mid. (Schw.) Stems of Irish Potato.

testaceum, Pers.—Mid. (Schw.) Dead stems of plants.

contextum, Pers.—Mid. (Schw.) Dead stems of plants.

reticulatum, Fr.—Mid. (Schw.) Dead leaves.

LEOCARPUS vernicosus, Lk.—Mid. and Up. Dead leaves, sticks, &c.

DIDYMIUM Clavus, Fr.—Mid. and Up. Rotting leaves.

furfuraceum, Fr.—Common. Dead wood.

rufipes, Fr.—Mid. (Schw.) On trunks.

tigrinum, Schrad.—Mid. (Schw.) Dead wood.

squamulosum, Fr.—Mid. (Schw.) Fallen leaves.

farinaceum, Schrad.—Low. Fallen leaves.

pusillum, B. & C.—Low. Rotting stem of herb.

xanthopus, Fr.—Common. Dead leaves, stems, &c.

chrysosepton, B. & C.—Low. Rotting leaves.

Ravenelii, B. & C.—Up. (Rav.) Rotten wood.

spumarioides, Fr.—Mid. and Up. Rotting leaves,

Moss, &c.

luteo-griseum, B. & C.—Low. and Mid. Living leaves
of Gonolobus, &c.

polycephalum, Schw.—Low. and Mid. Trunks, sticks,
leaves, &c.

Curtisii, Berk.—Low. Living grass and leaves.
megalospermum, B. & C.—Low. Dead leaves.
Physaroides, Fr.—Low. Bark of trunks.
cinereum, Fr.—Low. and Mid. Bark of trunks.
terrigenum, B. & C.—Mid. Naked clayey soil.

PHYSARUM *nutans*, Pers.—Common. On dead wood.
aureum, Pers.—Common. On dead wood.
sulphureum, A. & S.—Mid. (Schw.) Dead leaves.
columbinum, Pers.—Mid. (Schw.) Trunk of Birch.
eupriceps, B. & R.—Low. Rotten Pine wood.
hyalinum, Pers.—Mid. (Schw.) Bark of trunks.
Licea, Fr.—Mid. (Schw.) Pine wood.
album, Fr.—Low. Fallen leaves.
decipiens, B. & C.—Low. Bark of Oak trunk.
confluens, Pers.—Mid. (Schw.) Stumps.
elegans, Schw.—Mid. (Schw.) Leaves and plants.
effusum, Schw.—Mid. (Schw.) On tan-bark.

ANGIORIDIUM *sinuosum*, Grev.—Common. Leaves, stems, &c.

CRATERIUM *pedunculatum*, Trent.—Mid. (Schw.) Leaves, stems, &c.
leucocephalum, Dittm.—Mid. (Schw.) Bits of wood.
globosum, Fr.—Low. Corn stalks.

DIACHEA *elegans*, Fr.—Common. Leaves, stems, grass, &c.

STEMONITIS *fusca*, Roth.—Common. Wood, leaves, Moss, &c.
ferruginea, Ehrb.—Common. Carious wood.
typhoides, D. C.—Low. and Mid. Wood and sticks.
oblonga, Fr.—Mid. Bark of trunks.
ovata, Pers.—Low. and Mid. Dead wood.
obtusata, Fr.—Common. Dead wood.
tenerrima, M. A. C.—Low. Dead stems.
papillata, Pers.—Mid. (Schw.) On wood.
Physaroides, A. & S.—Mid. (Schw.) Birch trunk.

ENERTHENEMA *elegans*, Bowm.—Low. Old roof of shed.

DICTYDIUM *umbilicatum*, Schrad.—Common. Pine wood.
microcarpum, Schrad.—Common. Carious wood.
venosum, Schrad.—Mid. (Schw.) Carious wood.

CELEBRARIA *macrocarpa*, Schrad.—Mid. (Schw.) Pine wood.
argillacea, Pers.—Mid. (Schw.) Rotten trunks.
purpurea, Schrad.—Mid. (Schw.) Carious wood.
vulgaris, Schrad.—Mid. (Schw.) Rotten trunks.

intricata, Schrad.—Common. Carious wood.
tenella, Schrad.—Mid. (Schw.) Carious wood.
minutissima, Schw.—Mid. (Schw.) Carious wood.
microscopica, B. & C.—Low. Old Pine wood.

ARCYRIA *punicea*, Pers.—Common. Carious wood.
incarnata, Pers.—Common. Carious wood.
cinerea, Fl. Dan.—Common. Carious wood.
nutans, Grev.—Common. Carious wood.
pallida, B. & C.—Low. Carious wood.
umbrina, Schum.—Common. Carious wood.
ochroleuca, Fr.—Mid. (Schw.) Carious wood.
globosa, Schw.—Mid. (Schw.) Chestnut burs.

TRICHIA *rubiformis*, Pers.—Mid. and Up. Rotten wood and Mosses.
pyriformis, Hoffm.—Common. Sticks and logs.
serotina, Schrad.—Common. Carious wood.
fallax, Pers.—Mid. (Schw.) Carious wood.
clavata, Pers.—Common. Carious wood.
nigripes, Pers.—Mid. (Schw.) Carious wood.
turbinata, With.—Common. Wood and sticks.
chrysosperma, D. C.—Common. Rotten wood.
varia, Pers.—Mid. and Up. Dead trunks and logs.
serpula, Pers.—Common. Dead herbs, sticks, &c.

LACHNOBOLUS *cribrosus*, Fr.—Mid. On logs.
cinereus, Schw.—Mid. (Schw.) Dead stems.

PERICILENA *populina*, Fr.—Common. Bark of trees.
marginata, Schw.—Low. and Mid. Bark of trees.
vermicularis, Fr. (Sum. Veg.)—Mid. (Schw.) Bark of trees.

luteo-valve, Fr. (Sum. Veg.)—Mid. (Schw.) Dead stems.

LICEA *cylindrica*, Fr.—Mid. and Up. Rotten wood.
fragiformis, Nces.—Common. Wood, Moss, &c.
stipitata, B. & R.—Low. and Up. Sticks and logs.
variabilis, Schrad.—Mid. (Schw.) Trunks.

TRICHODERMA *viride*, Pers.—Common. Bark and wood.

PYRENIUM *terrestre*, Tode.—Mid. (Schw.) Among putrid Lichens.

MYROTHECIUM *roridum*, Tode.—Low. Decaying leaves, &c.

Verrucaria, Dittm.—Low. Putrescent seeds of Watermelon.

HYPHELIA *terrestris*, Fr.—Mid. (Schw.) Shaded earth.

- NIDULARIA pulvinata*, Schw.—Common. On rotten wood.
CYATHUS striatus, Hoffm.—Low. and Mid. Earth.
 campanulatus, Fr.—Common. Woody matter.
 Crucibulum, Pers.—Common. Wood and bark.
SPHÆROBOLUS stellatus, Tode.—Common. Wet or carious wood.
THELEBOLUS stercoreus, Tode.—Mid. (Schw.) Among manure.

III. CONIOMYCETES.

- MICROTHYRIUM Stihlaci*, DeNot.—Common. Branches of Bamboo.
LEPTOSTROMA caricinum, Fr.—Common. Leaves of Carex.
 Spireæ, Fr.—Low. Leaves of Paspalum.
 litigiosum, Desm.—Low. and Mid. Stems of Pteris.
 vulgare, Fr.—Common. Stems of plants.
 Sphaerioides, Fr.—Mid. (Schw.) Stems of plants.
 Actææ, Schw.—Mid. (Schw.) Stems of Rattle Top.
 Seudentium, Schw.—Mid. (Schw.) Shoots of *Amphicarpæa*.
 Donacis, Schw.—Mid. (Schw.) Stalks of *Arundo donax*.
PHOMA miserum, B. & C.—Low. Bark of Rose bushes.
 erumpens, B. & C.—Mid. (Schw.) Branches of Bamboo.
 decorticans, B. & C.—Low. Branchlets of Water Oak.
 smilacinum, B. & C.—Low. On *S. laurifolia*.
 pallens, B. & C.—Low. Dead branches of Grape vine.
 Radula, B. & Br.—Low. Twigs of Apple and Sycamore.
 mixtum, B. & C.—Low. Branches of Tulip Tree.
 Syringæ, B. & C.—Low. Branches of Lilac.
 mamillanum, B. & C.—Low. Leaf stalks of Sweet Bay.
 longipes, B. & C.—Mid. Cedar twigs.
 subconnata, B. & C.—Mid. (Schw.) Stalks of *Gossypium*.
 Cucurbitacearum, (Fr.)—Common. On dry Cucurbita.
 Horticola, B. & C.—Low. Bean pods.
 Cimicifugæ, B. & C.—Mid. and Up. Stems of Rattle Top.

Glandicola, B. & C.—Low. Old White Oak Acorns.
 complanata, Fr.—Mid. (Schw.) Stems of herbs.

navicularis, B. & C.—Mid. (Schw.) Stems of herbs.
 aterrinum, B. & C.—Low. Old Corn stalks.

Uvicola, B. & C.—Low. and Mid. Rotting grapes.

Cacti, B. & C.—Low. Dead *C. triangularis*.

soriatum, B. & C.—Low. Dead *C. triangularis*.

cucurbitale, B. & C.—Low. Seeds of Watermelon.

Citrulli, B. & C.—Low. Seeds of Watermelon.

Peponis, B. & C.—Low. Seeds of Pumpkin.

cinctum, B. & C.—Low. Dying leaves of Elm.

maculaecola, B. & C.—Mid. Leaves of *Hedera*.

concentricum, Desm.—Low. Leaves of *Yucca*.

campylosporum, B. & C.—Low. Leaves of *Panicum*.

Filum, Fr.—Common. Grass leaves, &c.

Poarum, B. & C.—Low. Leaves of *P. hirsuta*.

aridum, B. & C.—Low. Leaves of *Cyrilla*.

Andromedæ, Schw.—Mid. (Schw.) Leaves of *A. axillaris*.

APIOSPORIUM stilbosporoideum, Fr.—Mid. (Schw.) Carious limbs.

CRYPTOSPORIUM filicinum, B. & C.—Low. Stem of Ferns.

Novæboracense, B. & C.—Mts. Bark of *Abies*.

SPÆRONEMA subulatum, Fr.—Mid. Rotting *Agarics*.

rufum, Fr.—Low. Bark of *Magnolia glauca*.

epigloium, B. & C.—Low. and Up. On *Tremella*.

Spina, B. & C.—Low. and Mid. Branches of *Fraxinus*.

aciculare, Fr.—Mid. (Schw.) On wood.

Acrosporum, Fr.—Mid. (Schw.) On fire wood.

macrosporum, B. & C.—Low. Branches of *Robinia*.

Ampelopsidis, B. & C.—Mts. Branches of *A. quinquefolia*.

penicillatum, B. & C.—Low. Rotting wood and bark.

ventricosum, Fr.—Mid. (Schw.) Bark of trunks.

cylindricum, Fr.—Mid. (Schw.) Stems of herbs.

conicum, Fr.—Mid. (Schw.) On wood.

hemisphericum, Fr.—Mid. (Schw.) Willow wood.

echinatum, B. & C.—Mts. Petiole discs of *Rhododendron*.

?collapsum, B. & C.—Low. and Mid. Leaves of *Pyrus*.

nitidum, B. & C.—Mid. Dead twigs of Negundo.
radulum, B. & C.—Low. Branches of Maple.

HYPOCENIA obtusa, B. & C.—Low. and Mid. Branches of Maple.

APOSPILERIA acuta, Berk.—Mid. (Schw.) Stems of herbs.

CESATIA turbinata, B. & C.—Low. Branches of Kerria, Persica, &c.

ACROSPERMUM compressum, Tode.—Low. Stem of herbs.

foliicolum, B. & C.—Low. Various dead leaves.

viridulum, B. & C.—Low. Stem of herb.

DIPLODIA vulgaris, Fr.—Common. On dead branchlets.

Viticola, Desm.—Low. On Grape vines.

quisquiliarum, B. & C.—Low. Dried fibrillose roots.

pyrenophora, (Fr.)—Low. Branches of Apple tree.

dispersa, B. & C.—Low. Branches of Smilax.

tephrospora, B. & C.—Low. and Mid. Branches of Magnolia.

Pericarpui, B. & C.—Low. and Mid. Husks of Hickory.

Mori, Berk.—Mid. Branchlets of Mulberry.

megalospora, B. & C.—Low. Cones of Pinus taeda.

Zææ, Lev.—Common. Old Corn-stalks.

Buxi, Fr.—Common. Dead Box leaves.

Visci, Fr.—Low. and Mid. Dead Mistletoe.

HENDERSONIA variabilis, B. & C.—Low. Dead leaves of Oak.

prominula, B. & C.—Low. Dead leaves of Apple tree.

Curtisii, Berk.—Low. Dead leaves of Narcissus.

effusa, B. & C.—Low. Dead leaves of Aristida stricta.

nobilis, B. & C.—Low. Wood of Hickory branches.

hyalopus, B. & C.—Low. Branches of Rhus copallina.

pubens, B. & C.—Mid. Branches of Robinia.

pauciseptata, B. & C.—Low. Naked limbs of Lagerstræmia.

SPHÆROPSIS pulchella, B. & C.—Com. Branches of Rhus copallina.

fusiger, B. & C.—Mid. Branches of Wistaria.

globosa, B. & C.—Mts. Branches of Cratægus.

hederaephila, B. & C.—Mid. Branches of Hedera.

Pennsylvanica, B. & C.—Mid. *Fraxinus*.
cellulosa, B. & C.—Low. Branches of *Ficus*.
Celtidis, M. A. C.—Mid. Galls of *Celtis*.
impressa, B. & C.—Low. Branches of *Morus*.
Corni, B. & C.—Low. Branches of *C. florida*.
Smilacis, B. & C.—Low. Branches of *Smilax*.
Malicola, B. & C.—Low. Dry wood of Apple tree.
insignis, B. & C.—Mid. Old Acorns.
caulincola, B. & C.—Low. Stem of herb.
coriarum, B. & C.—Mid. Old leather.
Gallæ, B. & C.—Common. Oak galls.
Candollei, B. & Br.—Mid. Leaves of Box.
seminalis, B. & C.—Low. Dried seeds of Watermelon.
Rhoidis, B. & C.—Low. and Mid.? Leaves of *Rhus*
copallina.

VERMICULARIA *Dematium*, Fr.—Common. Dead stems.
Liliaceorum, Schw.—Low. and Mid. Liliaceous
 stems.
acuminata, Schw.—Low. Dead Iris.
Graminum, Lib.—Low. Culm of *Zea*.
punctans, Schw.—Low. Leaves of *Andropogon*.
carbonacea, B. & C.—Low. Leaves of *Magnol.*
grandiflora.
theceicola, Schw.—Mid. (Schw.) Capsules of *Dicranum*.

DISCOSIA *Artoceas*, Fr.—Common. On dead leaves and old Acorns.
clypeata, Not.—Low. and Mid. On dead leaves.
rugulosa, B. & C.—Up. Hickory leaves.
nitidissima, B. & C.—Low. Red-bay leaves.
ocellata, B. & C.—Low. Leaves of *Magnol. grandiflora*.

SEPTORIA *Graminum*, Desm.—Low. Leaves of *Panicum*.
Plantaginicola, B. & C.—Mid. Leaves of *P. lanceolata*.
Violæ, Desm.—Mid. Leaves of Violets.
Magnoliæ, B. & C.—Low. Leaves of *M. glauca*.
Liriodendri, B. & C.—Low. Leaves of Tulip Tree.
Speculariæ, B. & C.—Low. Leaves of *S. perfoliata*.
ocellata, B. & C.—Low. Fallen leaves.
Dolichos, B. & C.—Low. Leaves of Cow Pea.
Rubi, B. & C.—Common. Leaves of Blackberry.

Vitis, B. & C.—Common. Leaves of Grape and Creeper.
Oenotheræ, B. & C.—Low. Leaves of *O. sinuata*.
nigricans, Schw.—Mid. (Schw.) Leaves of Chestnut.
maculans, B. & C.—Low. Leaves of Post Oak.
recta, B. & C.—Low. Fallen leaves.
fruticicola, B. & C.—Low. Old fruit of *Passiflora* and
Malus.

Phlyctænoides, B. & C.—Mid. In *Datura*.
saturnina, B. & C.—Mid. (Schw.) On stems.
breviuscula, B. & C.—Low. Branches of *Robinia*.
decipiens, B. & C.—Low. Branches of *Lonicera*.

PESTALOZZIA concentrica, B. & R.—Mid. and Up. Leaves of *Malus*
and *Cratægus*.

Guepini, Desm.—Low. and Mid. Leaves of *Sassa-*
fras, &c.

grandis, B. & C.—Up. Leaves of *Smilax*.

Pezizoides, Not.—Mid. Leaves of *Vitis*.

hysteriiformis, B. & C.—Common. Leaves of *Quercus*
nigra, &c.

stictica, B. & C.—Low. Leaves of *Platanus*.

funerea, Desm.—Low. Branches of *Cupressus thy-*
oides.

torulosa, B. & C.—Mid. Old seeds of Watermelon.

ASTEROMA Robergei, Desm.—Low. Inside of dead stems.

vernica, Fr.—Mid. (Schw.) Dead stems.

Himantia, Fr.—Mid. (Schw.) Dead stems.

elegans, (Schw.)—Mid. (Schw.) Dead stems of *Phyto-*
lacea.

crustacea, (Schw.)—Mid. (Schw.) Dead stems of *Phy-*
tolacea.

inelegans, (Schw.)—Mid. (Schw.) Dead stems of *Phy-*
tolacea.

Impatiens, (Schw.)—Mid. (Schw.) Dead stems of *I.*
fulva.

lineola, (Schw.)—Mid. (Schw.) Dead stems of *Liliacei*.

Rosæ, Lib.—Low. Leaves of *Rosa*.

geographica, Fr.—Low. Leaves of *Rosa*.

Xanthii, Fr.—Mid. (Schw.) Leaves of *X. strumarium*.

Diospyri, (Schw.)—Mid. (Schw.) Leaves of *Persimon*.

Panici, (Schw.)—Mid. (Schw.) Leaves of *Panicum*.

MELANCONIUM *Dothidea*, Schw.—Mid. Bark of Mulberry.

cinctum, B. & C.—Up. Bark of Chestnut limbs.

sphæroideum, Lk.—Mid. (Schw.) Bark of Birch.

sphaerospermum, Lk.—Mid. (Schw.) On Reed stems.

DISCELLA *Magnoliæ*, B. & C.—Up. Bark of limbs of *M. cordata*.

DIDYMOSPORIUM *elevatum*, Lk.—Mid. (Schw.) Bark of Birch.

STILBOSPORA *magna*, Berk.—Up. Bark of Walnut.

ovata, Pers.—Common. On bark.

macrosperma, Pers.—Mid. (Schw.) Putrid wood.

tenuis, B. & C.—Low. Bark of *Morus*.

Pinicola, B. & C.—Low. Fallen Pine leaves.

ASTEROSPORIUM *Hoffmani*, Kze.—Mid. (Schw.) Dead limbs.

CYTISPORA *rubescens*, Fr.—Up. Bark of *Pyrus Americana*.

chrysosperma, Fr.—Mid. (Schw.) On limbs.

Pinastri, Fr.—Up. Pine leaves.

Ailanthi, B. & C.—Low. Branches of *Ailanthus*.

chloroglœa, B. & C.—Up. Branches of *Cornus sericea*.

leucosperma, Fr.—Common. Branches of various trees.

leucophthalma, B. & C.—Low. Bark of *Prunus Caroliniana*.

melasperma, Fr.—Mid. (Schw.) Bark of *Betula*.

parva, B. & C.—Low. Branches of *Robinia*.

betulina, Ehrb.—Mid. (Schw.) Bark of Birch.

laxa, B. & C.—Low. Bark of *Calycanthus*.

hyalosperma, Fr.—Mid. Bark of Maple.

Persicæ, Schw.—Common. Branchlets of Peach.

sphærocephala, (Schw.)—Mid. (Schw.) Branchlets of *Hydrangea* or *Sassafras*.

NEMASPORA *crocea*, Pers.—Common. Trunks and branches.

erythrella, B. & C.—Low. Branches of Rose.

decipiens, B. & R.—Up. (Rav.) On limbs.

MYXOSPORIUM *nitidum*, B. & C.—Up. Branches of *Cornus alternifolia*.

Musæ, B. & C.—Low. On decaying Bananas.

CORYNEUM *compactum*, B. & Br.—Mid. Branches of *Betula nigra*.

pulvinatum, Kze.—Mid. Branches of *Hedera*.

Staphyleæ, M. A. C.—Mid. Branches of *Staphylea*.

decipiens, B. & C.—Up. Branches of *Castanea*.

unicolor, M. A. C.—Mid. Bark of Cedar.

BACTRIDIVM flavum, Kze.—Mid. (Schw.) Carious wood.

? *EXCIPULA Liliorum*, Schw.—Mid. (Schw.) Stems of Liliu.

DINEMASPORIVM strigosum, (Fr.)—Common. Wood and stems of plants.

hispidulum, (Schrad.)—Mid. (Schw.) On Sambucus.

SEURIDIVM inarticulatum, B. & C.—Low. Branchlets of Liquidambar.

TORVLA herbarum, Pers.—Common. Stems of herbs.

antennata, Pers.—Mid. (Schw.) Pine roofs.

dissita, B. & C.—Low. Inside of Oak log.

DICTYOSPORIVM elegans, Cda.—Low. Branch of Magnolia glauca.

HELICOMYCES aureus, Cda.—Low. Wood of Pine and Cedar.

SEPTONEMA spilomeum, Berk.—Common. On rails, boards, &c.

cespitosum, B. & C.—Low. Leaves of Liriodendron.

circinatum, B. & C.—Low. Leaves of Liriodendron.

obscurum, B. & C.—Low. Wet Pine wood.

dendryphioides, B. & C.—Low. Wet Pine wood.

multiplex, B. & C.—Low. Wood of Nyssa and Quercus.

breviusculum, B. & C.—Low. Living trunk of Acer.

SPORIDESMIUM concinnum, Berk.—Common. Carious wood.

fusus, B. & C.—Up. Branch of Magnol. acuminata.

adscendens, Berk.—Low. Rotting wood and bark.

Vaccinii, B. & C.—Low. Wood of Vaccinium.

epiphyllum, B. & C.—Up. Living leaves of Castanea.

curvatum, B. & C.—Common. Living leaves of Cratægus.

Asteriscus, B. & C.—Low. Living leaves of Pycnanthemum.

maculare, B. & C.—Low. Living leaves of Magnol. glauca.

acinosum, B. & C.—Low. Carious Oak wood.

stygium, B. & C.—Low. Carious Oak wood.

atrum, Lk.—Mid. Branches of Hedera.

compactum, . & C.—Common. Carious wood.

nigrum, Berk.—Up. (Rav.) Carious wood.

compositum, B. & R.—Up. (Rav.) On rails and wood.

Lepraria, Berk.—Mid. and Up. Old rails and wood.
melanopum, B. & Br.—Up. Old rails and wood.
chartarum, B. & C.—Mid. Damp paper.

CONIOTHECIUM Juglandis, B. & C.—Mid. Bark of Walnut.

SPILOCÆA Pomi, Fr.—Common. Skin of Apples.

GYMNOSPORIUM fulvum, B. & C.—Low. Putrid wood.

Zea, B. & C.—Low. Dead Corn stalks.

AREGMA speciosum, Fr.—Mts. Branches of Rose bush.

inucronatum, (Pers.)—Mid. and Up. Leaves of Rose.

PUCCINIA Silphii, Schw.—Low. and Mid. Leaves of Silphium.

Amorphæ, M. A. C.—Low. Leaves of *Amorpha*.

Myrrhis, Schw.—Mid. Leaves of *Osmorhiza*.

Circeæ, Pers.—Mid. and Up. Leaves of *Circeæ*.

microsperma, B. & C.—Low. Leaves of *Lobelia puberula*.

aculeata, Schw.—Common. Leaves of *Podophyllum*.

Helianthi, Schw.—Common. Leaves of *Helianthus*.

Verbesinæ, Schw.—Common. Leaves of *Verbesina*.

Heliopsidis, Schw.—Mid. (Schw.) Leaves of *Heliopsis*
 and *Vernonia*.

Xanthii, Schw.—Common. Leaves of *Xanthium* and
Ambrosia.

Centaureæ, D. C.—Low. Leaves of *Conoclinium*.

Menthæ, Pers.—Common. Leaves of *Labiatae*.

Smilacis, Schw.—Common. Leaves of *Smilax*.

Galii, Schw.—Mid. (Schw.) Leaves of *Galium*.

solida, Schw.—Mid. (Schw.) Leaves of *Anemone*.

Polygonorum, Schlecht.—Mid. (Schw.) On *Polygonum*.

bullata, Schw.—Mid. (Schw.) Stem of herbs.

Pruni, D. C.—Low. and Mid. Leaves of *Prunus*.

Graminis, D. C. (Rust.)—Common. Leaves and culms
 of Grasses.

Arundinariæ, Schw.—Low. Leaves of Reed.

striola, Strauss.—Common. Leaves of Gram: and Cyp.

Caricis, D. C.—Leaves of Sedge Grass.

GYMNOSPORANGIUM Juniperi, Lk.—Common. Branches of Cedar.

PODISOMA macropus, Schw. (Cedar Balls.)—Common. Branches of
 Cedar.

Juniperi, Lk.—Mid. Branches of Cedar.

UREDIO Rubigo, D. C. (Rust.)—Com. Leaves and stems of Grasses.

- caricina*, D. C.—Low. and Mid. Leaves of *Carex*.
linearis, Pers.—Common. Leaves of *Triticum*, &c.
Azaleæ, Schw.—Low. and Mid. Leaves of *Honeysuckle*.
Hydrangeæ, B. & C.—Mid. Leaves of *H. arborescens*.
Prunastri, D. C.—Low. Leaves of *Persica*.
epitea, Kze.—Common. Leaves of *Willows*.
Vacciniorum, Johnst.—Low. Leaves of *V. hirtellum*.
Toxicodendri, B. & R.—Mid. Branches and petioles of
Toxicodendron.
Helianthi, Schw.—Common. Leaves of *Helianthus* and
Vernonia.
Terebinthinaceæ, Schw.—Mid. (Schw.) Leaves of *Silph*:
terebinth:
Ipomœæ, Schw.—Low. and Mid. Leaves of *Ipomœa*.
Campanularum, Lk.—Mid. (Schw.) Leaves of *Specularia*.
Onagrarum, Lk.—Mid. (Schw.) Leaves of *Circæa*.
Hydrocotyles, Lk.—Low. Leaves of *Hydrocotyle*.
Smilacis, Schw.—Common. Leaves of *Smilax*.
Polygonorum, D. C.—Low. and Mid. Leaves of *Polygonum*.
Solidaginis, Schw.—Common. Leaves of *Aster*, *Solida-*
go, &c.
Potentillæ, D. C.—Common. Leaves of *Potentilla* and
Agrimonia.
Ruborum, D. C.—Common. Leaves of *Rubus*.
luminata, (Schw.)—Common. Leaves of *Rubus*.
effusa, Strauss.—Common. Branches and petioles of *Rosa*.
Elephantopodis, Schw.—Com. Leaves of *Elephantopus*.
Labiatarum, D. C.—Common. Leaves of *Labiatae*.
Hyptidis, M. A. C.—Low. Stem and leaves of *Hyptis*.
punctosum, Lk.—Mid. (Schw.) Leaves of *Euphorbia*.
Leguminosarum, Lk.—Mid. (Schw.) Leaves of *Faba*.
Heucherae, Schw.—Mid. (Schw.) Leaves of *H. Americana*.
Ari-Virginici, Schw.—Mid. (Schw.) Leaves of *Arum*.
UROMYCES appendiculosa, Lev.—Mid. (Schw.) Leaves of *Pisum*
and *Phaseolus*.
apiculosa, Lev.—Common. Leaves of *Euphorbia*, &c.
solida, B. & C.—Low. and Mid. Leaves of *Desmodium*.
Phaseoli, (Strauss.)—Common. Leaves of *Phaseolus*, &c.

Lespedezæ-violaceæ, (Schw.)—Common. Leaves of *L. violacea*.

Lespedezæ-procumbentis, (Schw.)—Common. Leaves of *L. procumbens*.

Spermacoces, (Schw.)—Common. Stem and leaves of *S. diodina*.

Hyperici, (Schw.)—Mid. and Up. Leaves of *Hypericum*.

PILEOLARIA brevipes, B. & R.—Common. Leaves of *Toxicodendron*.

RAVENELLA glanduliformis, B. & C.—Low. and Mid. Leaves of *Tephrosia*.

USTILAGO segetum, Pers. (Smut.)—Common. In heads of Oats, &c. *foetens*, B. & C. (Stinking Smut.)—Mid. In heads of Wheat.

Zææ, Schw. (Corn Smut.)—Common. Ears of Corn. *spermophorus*, B. & C.—Low. Flowers of *Poa megastachya*.

Montagnei, Tul.—Low.—Seeds of *Rhynchospora*.

Junci, Schw.—Mid. (Schw.) Seed of *Juncus*.

Urceolorum, (D. C.)—Mid. and Up. Seeds of *Carex*.

nutriculosa, (Nees.)—Common. Seeds of *Polygonum*.

hypodites, Fr.—Low. Culms of *Arundinaria*.

RÆSTELIA lacerata, (Sow.)—Common. Leaves of *Cratægus*, &c.

cancellata, (Jacq.)—Common. Leaves of Apple trees.

Fraxini, (Schw.)—Mid. and Low. Leaves of *Fraxinus*.

AECIDIUM Cimicifugæ, Schw.—Mid. & Up. Leaves of *Cimicifuga*.

Podophylli, Schw.—Common. Leaves of *P. peltatum*.

Hibisci, Schw.—Up. Leaves of *H. Moscheutos*.

Penstemonis, Schw.—Mid. Leaves of *Penstemon*.

Ari, Berk.—Mid. (Schw.) Leaves of *A. triphyllum*.

leucostictum, B. & C.—Low. Leaves of *Lespedeza*.

Euphorbiæ-hypericifoliæ, Sz.—Low. and Mid. Leaves of *E. hypericifolia*.

Epilobii, D. C.—Low. Leaves of *Ludwigia*.

Grossulariæ, D. C.—Mts. Leaves of *Ribes*.

Compositarum, Mart.—Common. Leaves of *Compositæ*.

Convolvuli, Schw.—Low. Leaves of *Ipomœa*.

Uvulariæ, Schw.—Mid. (Schw.) Leaves of *Uvularia*.

Dracontii, Schw.—Mid. (Schw.) Leaves of *Arum Dracontium*.

Rumicis, Pers.—Mid. (Schw.) On *Rumices*.

Lysimachiae, Schlect.—Mid. (Schw.) Leaves of *Lysimachia*.

Apocyni, Schw.—Mid. (Schw.) Leaves of *Apocynum*.

Asterum, Schw.—Mid. (Schw.) Leaves of *Aster*.

Helianthi-mollis, Schw.—Mid. (Schw.) Leaves of *H. mollis*.

Clematitis, Schw.—Low. and Mid. Leaves of *C. Virginica*.

Ranunculacearum, D. C.—Mid. (Schw.) Leaves of *Ranunculi*.

Geranii, D. C.—Mid. (Schw.) Leaves of *Geranium*.

Impatiensis, Schw.—Mid. (Schw.) Leaves of *Impatiens*.

Hyperici-frondosi, Schw.—Mid. (Schw.) Leaves of *H. frondosum*.

Violæ, D. C.—Mid. (Schw.) Leaves of *Viola*.

Urticæ, D. C.—Mid. (Schw.) Leaves of *Urtica* and *Cynoglossum*.

Sambuci, Schw.—Mid. (Schw.) Leaves of *S. Canadensis*.

Berberidis, Pers.—Mid. (Schw.) Leaves of *B. Canadensis*.

crassum, D. C.—Low. Leaves and petiole of *Berchemia*.

Smilacis, Schw.—Mid. (Schw.) Leaves of *Smilax*.

PERIDERMUM Pini, Fr.—Common. Leaves and bark of Pines.

CRONARTIUM asclepiadenum, Fr.—Mid. Leaves of *Comptonia*.

CYSTOPTIS candidus, Lev.—Common. Leaves of *Portulacca*, *Capsella*, &c.

IV. HYPHOMYCETES.

- ISARIA** *farinosa*, Fr.—Low. and Mid. Buried chrysalids.
Sphingum, Schw.—Mid. Dead Moths on bushes.
Araneorum, Schw.—Mid. (Schw.) Dead spiders.
nigripes, Schw.—Mid. (Schw.) Buried chrysalids.
carnea, Pers.—Mid. (Schw.) Bark and leaves on the ground.
epiphylla, Pers.—Mid. (Schw.) Fallen leaves.
citrina, Pers.—Mid. (Schw.) Rotten trunks.
brachiata, Schum.—Mid. (Schw.) On dead Agarics.
umbrina, Pers.—Low. and Mid. Rotten wood and bark.
- CERATIUM** *Hydnoides*, A. & S.—Common. Putrid wood.
Porioides, A. & S.—Low. and Mid. Pine wood.
- PTERULA** *plumosa*, Schw.—Low. and Mid. Among herbs and shrubs.
- DACRINA** *cinnabarina*, Nees.—Mid. (Schw.) Under Walnut bark.
- STILBUM** *tomentosum*, Schrad.—Low. On *Trichia* and *Areyria*.
finetarium, Berk.—Low. On Rabbit dung.
byssinum, Pers.—Mid. (Schw.) Putrid Agarics.
bulbosum, Tode.—Mid. (Schw.) On stems.
piliforme, Pers.—Mid. (Schw.) Chestnut burs.
lateritium, Berk.—Common. On bark.
cinereo-rubrum, B. & C.—Low. *Cyrilla* and *Hibiscus Syriacus*.
cinnabarinum, Mont.—Low. and Mid. Bark of *Morus* and *Vitis*.
carcinophthalmum, B. & C.—Low. Dead stems of *Pastinaca*.
leucocephalum, B. & C.—Low. Bark of *Carya*.
Rhois, B. & C.—Common. Bark of *Rhus*.
vulgare, Tode.—Mid. (Schw.) On wood.
gelatinosum, Pers.—Mid. (Schw.) On trunks.
rigidum, Pers.—Mid. (Schw.) Putrid wood.
turbinatum, Tode.—Mid. (Schw.) On wood.
rubicundum, Tode.—Mid. (Schw.) Beech stumps.

- ATRACTIUM** *Fusisporium*, B. & C.—Up. Bark of *Acer Pennsylvanicum*.
- GRAPHIUM** *explicatum*, B. & C.—Low. Limbs of *Quercus* and *Persica*.
clavisporum, B. & C.—Low. Living Grape leaves.
- HYALOPUS** *mucorinus*, B. & C.—Low. On excrement of birds.
parasitans, B. & C.—Low. On exoete *Hydnum*.
griseus, B. & C.—Low. Under bark of *Nyssa*.
- EPICOCCEUM** *scabrum*, Cda.—Low. Dried root of *Nyssa*.
neglectum, Desm.—Low. Tassels of Indian Corn.
sphaerospermum, B. & C.—Low. Dead leaves of *Arun-
dinarie*.
- ILLOSPORIUM** *coccineum*, Fr.—Low. On bark and Lichens.
persicinum, Fr.—Low. On pine palings.
- STIGMATELLA** *aurantiaca*, B. & C.—Low. Bark and wood of *Hibise*:
Syriacus.
- FUSARIUM** *roseum*, Lk.—Common. Dead stems.
lateritium, Nees.—Low. Bark of trees.
aurantiacum, Cda.—Low. On putrid *Cucurbita*.
pallens, B. & C.—Low. Heads of *Juncus*.
arcuatum, B. & C.—Low. Bark of *P. Malus*.
sticticum, B. & C.—Low. Dead twigs of *Persica*.
- VOLUTELLA** *ciliata*, Fr.—Mid. (Schw.) Dejected stems.
- GLEOSPORIUM** *versicolor*, B. & C.—Low. On putrescent Apples.
Peponis, B. & C.—Low. Putrescent Muskmelon.
- CHEIROMYCES** *stellatus*, B. & C.—Low. On *Scirpus Eriophorum*.
- TUBERCULARIA** *granulata*, Pers.—Common. On bark.
vulgaris, Tode.—Mid. (Schw.) Bark of *Ribes*, &c.
minor, Lk.—Mid. (Schw.) Limbs of *Castanea*.
microsperma, B. & C.—Low. Dejected Pine cones.
dubia, Schw.—Low. and Mid. Bark of *Rhus*, &c.
nigricans, D. C.—Mid. Bark of *Fraxinus*, &c.
persicina, Dittm.—Low. On *Uredo luminata*.
- PACHNOCYBE** *subulata*, Berk.—Low. On bark.
rosella, B. & C.—Low. Bark of *Robinia*, *Melia*, &c.
- SPOROCYBE** *calicioides*, Fr.—Common. On bark.
Rhois, B. & C.—Low. and Mid. Bark of *Rhus*.
Persicæ, Fr.—Common. Bark of *Persica*, and *Cerasus*.
Byssoides, Fr.—Common. Putrescent stems and bark.

fasciculata, (Schw.)—Mid. (Schw.) Dead stems.
 bulbosa, (Schw.)—Mid. (Schw.) Dead stems.
 macularis, (Schw.)—Mid. (Schw.) Dead stems and wood.
 alternata, Berk.—Mid. Damp paper.

OEDEMIUM atrum, Cda.—Low. Branches and leaves.

MYXOTRICHUM affine, B. & C.—Low. Culms of *Arundinaria*.

ACTINOCLADIUM Penicillus, Fr.—Mid. (Schw.) Leaves of *Sassafras*.

GLENOSPORA Curtisii, B. & Desm.—Common. Living limbs of
Nyssa, *Quercus*, &c.

Melioloides, M. A. C.—Mid. and Up. Living leaves
 of *Galax*.

HELMINTHOSPORIUM Tiara, B. & R.—Mts. (Rav.) Bark of trunks.

princeps, B. & C.—Low. Bark of living *Quercus*.

macrocarpon, Grev.—Com. Bark of branches.

corticale, Schw.—Mid. (Schw.) Bark of *Platanus*

obtusissimum, B. & C.—Mid. Bark of *Fraxinus*.

arbuscula, B. & C.—Low. Bark of *Rhus copal-*
lina.

caudatum, B. & C.—Mts. Bark of *Castanea*
pumila.

melanosporum, B. & C.—Low. Bark of dejected
 limbs.

siliquosum, B. & C.—Low. Bark of *Vitis* and
Smilax.

lanceolatum, B. & C.—Low. Bark and wood of
Cornus florida.

fragillimum, B. & C.—Low. Branches of *Smilax*.

rectum, B. & C.—Low. Carious wood.

molle, B. & C.—Low. Dead stems.

Ravenelii, M. A. C.—Low. Spikes of *Sporobo-*
lus Indicus.

nodosum, B. & C.—Low. Spikes of *Eleusine In-*
dica.

Petersii, B. & C.—Low. Leaves of *Smilax*.

PODOSPORTUM rigidum, Schw.—Common. On *Rhus* and *Ampe-*
lopsis.

Briareus, B. & C.—Low. Oak limbs.

prælongum, B. & C.—Low. Branches of *Vaccin:*
arboreum.

- MYSTROSPORIUM** Rubigo, B. & C.—Mid. and Up. On dead *Phytolacca* and Grasses.
- STEMPHYLIUM** Fuligo, B. & C.—Up. Branch of *Rhus glabrum*.
- TRIPOSPORIUM** elegans, Cda.—Low. Putrescent stems.
- DREPANISPORA** pannosa, B. & C.—Low. Disk of carious stump.
- HELICOSPORIUM** griseum, B. & C.—Low. Fallen limbs in swamps.
- HELICOSPORIUM** fuscum, B. & C.—Low. Under pine wood in swamps.
- HELICOMA** Berkeleyi, M. A. C.—Low. Old wood and bark.
- CLADOTRICHUM** seychiophorum, Cda.—Up. Carious wood.
- POLYTHRINCUM** Trifolii, Kze.—Common. Living leaves of *Trifolium*.
- CLADOSPORIUM** herbarum, Lk.—Common. Dead leaves and stems.
- CLADOSPORIUM** epiphyllum, Nees.—Mid. (Schw.) Fallen leaves.
- CLADOSPORIUM** apiculatum, B. & C.—Low. Dead stems of *Helianthus*.
- CLADOSPORIUM** stenosporum, B. & C.—Low. Fallen leaves of *P. Malus*.
- CLADOSPORIUM** microspermum, B. & C.—Low. Fallen leaves of *Querc. obtusifolia*.
- CLADOSPORIUM** personatum, B. & C.—Low. Leaves of *Arachis* and *Cassia*.
- CLADOSPORIUM** compactum, B. & C.—Low. Leaves of *Arundinaria*.
- CLADOSPORIUM** Bignoniae, Schw.—Mid. (Schw.) Legumes of *Bignonia* and *Catalpa*.
- CLADOSPORIUM** Funago, Lk.—Low. Leaves in low places.
- MACROSPORIUM** Cheiranthi, Fr.—Common. On dead herbs.
- MACROSPORIUM** circinans, B. & C.—Low. Decayed Cabbage leaves.
- MACROSPORIUM** pinguedinis, Berk.—Low. Dead stems.
- MACROSPORIUM** echinellum, B. & C.—Low. and Mid. Leaves of *Platanus* and *Ilex*.
- MACROSPORIUM** antennaeforme, B. & C.—Mid. and Up. Leaves of *Celtis*.
- ASPERGILLUS** glaucus, Lk.—Common. On various decaying matter.
- ASPERGILLUS** maximus, Lk.—Low. Putrid *Polyporus* and *Boletus*.
- ASPERGILLUS** alutaceus, B. & C.—Low. Mouldy Corn.
- ASPERGILLUS** Curtisii, Berk.—Low. and Mid. Carious wood, bark, &c.
- ASPERGILLUS** roseus, Lk.—Low. and Mid. Hen dung.

crocatus, B. & C.—Low. Rotting squash.
aurantiacus, Berk.—Low. Carious Pine wood.
pulvinatus, B. & C.—Low. Rotting sticks and herbs
 in heaps.

BOTRYTIS *Viticola*, B. & C.—Common. Leaves of Grape.
parasitica, Pers.—Low. and Mid. Cabbage leaves.
prasia, B. & C.—Low. Carious Oak wood.
pallida, B. & C.—Low. Dead leaves of *Arundinaria*.
lateritia, Fr.—Mid. and Up. Carious wood.
cinerea, Pers.—Mid. (Schw.) Rotting *Cucurbita*.
Bassiana, Bals.—Low. On Silk worms.

STREPTOTHRIX *atra*, B. & C.—Common. On limbs of Oak, &c.

CAMPSOTRICHUM *circinatum*, B. & C.—Low. Fallen leaves of *Magnol: grandifl.*

MENISPORA *apicalis*, B. & C.—Low. Carious wood in swamps.

VERTICILLIUM *pulvinatum*, B. & C.—Low. Bark of *Acacia Julibrissin*.

rosellum, B. & C.—Low. Fallen leaves of *Phoradendron*.

stigmatellum, B. & C.—Low. Rotting *Cucurbita verrucosa*.

PENICILLIUM *crustaceum*, Fr.—Common. On fruit, vinegar, &c.
candidum, Lk.—Mid. On Fungi.

armeniaceum, Berk.—Mid. Decaying vegetable matter.

DACTYLIUM *macrosporum*, Fr.—Low. and Mid. Rotting sticks, stems, &c.

dendroides, Fr.—Mid. (Schw.) On Fungi.

SPORODUM *atropurpureum*, B. & C.—Low. Dead roots of Grass.

RHINOTRICHUM *tenellum*, B. & C.—Low. Rotten Onion.

fusiferum, B. & C.—Low. Wood in wet ground.

ramosissimum, B. & C.—Low. Rotten wood.

Curtisii, Berk.—Low. Rotten wood in swamps.

armeniaceum, B. & C.—Low. Rotting *Polyp. Schweinitzii*.

cucumerinum, B. & C.—Low. Dejected culm of *Zea*.

SPOROTRICHUM *sulfureum*, Grev.—Mid. (Schw.) In fissures of wood.
vitellinum, Lk.—Mid. (Schw.) On posts.

vireseens, Fr.—Mid. (Schw.) On bark.

? *æruginosum*, Schw.—Mid. (Schw.) Rotten log.

ODIUM fructigenum, Kze.—Common. On putrescent fruit.

Monilioides, Lk.—Mid. (Schw.) Leaves of Grass.

aureum, Lk.—Mid. (Schw.) Fallen Oak leaves.

simile, Berk.—Common. Putrid wood.

pulvinatum, M. A. C.—Low. Putrid wood.

citrinellum, B. & C.—Low. On *Peziza alboviolascens*.

crustaceum, B. & C.—Low. On old curds.

TRICHOOTHECIUM roseum, Lk.—Common. On bark, Fungi, &c.

FUSIDIUM pyrinum, Mont.—Low. and Mid. On Pear leaves.

? *Farina*, Schw.—Mid. (Schw.) On bark.

ASTEROPHORA Agaricoides, Cda.—Mid. and Up. On *Nyctalis*.

SEPEDONIUM chrysospermum, Fr.—Common. Putrescent Boletus.

armeniaceum, B. & C.—Up. Putrid wood.

ZYGODESMUS effusus, B. & C.—Low. Carious Oak wood.

torulosus, B. & C.—Low. Rotten leaves.

fuscus, Cda.—Common. Rotten wood and leaves.

ramosissimus, B. & C.—Low. Under Pine wood.

olivaceus, B. & C.—Low. Under Pine wood.

Hydnoides, B. & C.—Low. Under Pine wood.

MONOTOSPOREA setosa, B. & C.—Low. Putrid wood in swamps.

COCCOTRICHUM erubescens, Schw.—Mid. (Schw.) Dejected sticks of wood.

FUSISPORIUM aurantiaceum, Lk.—Low. On dead plants.

roseum, Lk.—Common. On dead plants.

Buxi, Fr.—Low. and Mid. Leaves of Box.

miniatum, B. & C.—Mid. Wounded bark of *Cornus florida*.

ossicola, B. & C.—Low. On old bones in woods.

placentula, B. & C.—Low. Dead bark of *Melia*.

pubescens, B. & C.—Low. Leaves of *Desmodium lineare*.

griseum, Fr.—Low. Fallen Oak leaves.

CIRCINOTRICHUM candidum, Schw.—Mid. (Schw.) Rotten Pine wood.

Cratægi, B. & C.—Low. Leaves of *Cratægus*.

- PSILONIA apalospora, B. & C.—Low. Culms of Zea and Sorghum.
 fuscopurpurea, B. & C.—Low. Dead limbs of Quercus.
 uniseptata, B. & C.—Low. Rotten wood of Quercus.
 DENDRINA Diospyri, B. & C.—Low. and Mid. Dying leaves of
 Persimmon.

V. ASCOMYCETES.

- MORCHELLA *esculenta*, Pers. (Morel.)—Com. Earth in woods.
foraminulosa, Schw.—Mid. (Schw.) Earth in woods.
Caroliniana, Bosc.—Mid. Earth in woods.
 HELVELLA *crispa*, Fr.—Low. Pine woods.
lacunosa, Afz.—Low. Near rotten logs.
sulcata, Afz.—Mid. (Schw.) Shady woods.
Infula, Schæff.—Mid. (Schw.) Earth and Pine logs.
costata, Schw.—Mid. In sandy ground.
ephippium, Lev.—Common. About decaying trunks.
 VERPA *Caroliniana*, Schw.—Mid. (Schw.) On declivities.
 GEOGLOSSUM *hirsutum*, Pers.—Common. In wet ground.
difforme, Fr.—Common. In wet ground.
glabrum, Pers.—Mid. (Schw.) Damp mossy ground.
farinaceum, Schw.—Mid. (Schw.) In meadows.
 MITRULA *paludosa*, Fr.—Common. Swampy land.
exigua, Fr.—Mid. (Schw.) Dejected stems.
 LEOTIA *lubrica*, Pers.—Common. Moist woods.
chlorocephala, Schw.—Common. Damp sandy woods.
viscosa, Fr.—Low. and Mid. Damp sandy woods.
circinans, Pers.—Mid. (Schw.) Woods.
 RHIZINA *undulata*, Fr.—Common. Earth.
 PSILOPEZIA *nummularia*, Berk.—Low. and Mid. On carious wood.
 PEZIZA (I. ALEURIA.)
Acetabulum, L.—Low. On naked earth.
cinnamomeo-lutescens, Schw.—Mid. (Schw.) Among pu-
 trescent leaves.
Mitrula, Schw.—Mid. (Schw.) Among putrescent leaves.

clypeata, Schw.—Mid. (Schw.) Rotting log.
Schweinitzii, B. & C.—Mid. (Schw.) Earth.
badia, Pers.—Up. (Schw.) Earth.
onotica, Pers.—Mid. (Schw.) Shady places.
oblecta, Schw.—Mid. (Schw.) Among putrescent leaves.
cochleata, L.—Common. In woods.
velutina, B. & C.—Up. On lignous earth.
Spragueii, B. & C.—Up. Rotting wood.
vesiculosa, Bull.—Mid. (Schw.) In manured ground.
micropus, Pers.—Mid. (Schw.) Earth.
pustullata, Pers.—Mid. (Schw.) On trunks.
macropus, Pers.—Common. Earth and logs.
tuberosa, Bull.—Mid. (Schw.) Grassy land.
Rapulum, Bull.—Low. Earth.
catinus, Holmsk.—Mid. (Schw.) Rotten wood and lignous earth.
cupularis, L.—Low. and Mid. On burnt ground.
violacea, Pers.—Mid. (Schw.) Among *Kalmias*.
granulata, Bull.—Mid. (Schw.) Among manure.
rutilans, Fr.—Mid. (Schw.) Earth.
succosa, Berk.—Low. Moist earth.
ollaris, Fr.—Mid. (Schw.) Pine woods.
albocincta, B. & C.—Low. Mossy ground.
omphalodes, Bull.—Mid. and Up. Burnt places.
psammophila, B. & C.—Low. Damp sandy earth.
melaloma, A. & S.—Up. Burnt grounds.
rubricosa, Fr.—Mid. (Schw.) Earth.

(II. LACHNEA.)

coccinea, Jacq.—Up. Fallen limbs in wet ground.
tomentosa, Schum.—Mid. (Schw.) On wood.
nigrella, Pers.—Mid. (Schw.) Wood and earth.
hemispherica, Wigg.—Mid. and Up. Wood and earth.
brunnea, A. & S.—Mid. (Schw.) Burnt ground.
scutellata, L.—Common. Earth and wood.
Erinaceus, Schw.—Mid. (Schw.) Rotten trunks.
stercorea, Pers.—Mid. (Schw.) Manured and rich ground.
Theleboloides, A. & S.—Mid. (Schw.) Manured and rich ground.

- diversicolor, Fr.—Low. and Mid. On cow dung.
 decipiens, B. & C.—Mid. (Schw.) On Pine leaves.
 papillata, Pers.—Mid. (Schw.) On manure.
 ciliaris, Schrad.—Mid. (Schw.) Side of trunks.
 virginea, Batsch.—Low. and Mid. Fallen leaves and sticks.
 nivea, Fr.—Low. Fallen wood and branches.
 patula, Pers.—Mid. (Schw.) Dead Birch leaves.
 calycina, Schum.—Low. and Mid. Bark of Pine limbs, &c.
 cerinea, Pers.—Mid. On old palings.
 sericea, A. & S.—Mid. (Schw.) On wood.
 clandestina, Bull.—Low. and Mid. On various branches.
 fuscescens, Pers.—Mid. (Schw.) Fallen leaves.
 prolificans, Schw.—Mid. (Schw.) Disc of trunks and limbs.
 albo-violascens, A. & S.—Com. Bark, sticks and stems.
 corticalis, Pers.—Mid. (Schw.) Bark of trunks.
 cinereo-fusca, Schw.—Common. Wood and bark.
 rufo-olivacea, A. & S.—Mid. (Schw.) Stems of Rubus.
 flavo-fuliginea, A. & S.—Mid. (Schw.) Rotten wood and leaves.
 variegata, Fr.—Mid. (Schw.) On stems.
 leonina, Schw.—Mid. (Schw.) Carious wood of Elm.
 fulvo-cana, Schw.—Mid. (Schw.) Disc of stump.
 penicillata, Schw.—Mid. (Schw.) Bark of Vitis.
 hyalina, Pers.—Mid. (Schw.) On wood.
 sulfurea, Pers.—Mid. (Schw.) On chips.
 villosa, Pers.—Common. Bark of Vitis, Viburnum, &c.
 punctiformis, Fr.—Low. Bark of Robinia.
 anomala, Pers.—Common. Bark and wood.
 aurelia, Pers.—Low. Carious wood.
 caesia, Pers.—Low. On Oak wood.
 Rosæ, Fr.—Low. and Mid. On Rose branches.
 Hydrangææ, Schw.—Mid. (Schw.) Dead Hydrangea.
 pruinata, Schw.—Common. Bark of Vitis, Cornus, &c.
 Dædalea, Schw.—Common. Bark of Carya, Acer, &c.
 Bloxami, B. & Br.—Mid. Carious wood.
 fusca, Pers.—Mid. (Schw.) Bark of Elder.
 sanguinea, Pers.—Low. and Mid. Carious wood.
 subiculata, Schw.—Low. Wood in wet ground.

clatina, A. & S.—Mid. (Schw.) On *Pinus Canadensis*.
bolaris, Batsch.—Mid. (Schw.) On sticks, &c.
roseo-alba, Schw.—Mid. (Schw.) Bark of Dogwood.

(III. PHIALEA.)

firma, Pers.—Mid. (Schw.) Side of hollow trunks.
ciborioides, Fr.—Low. Fallen leaves.
serotina, Pers.—Mid. (Schw.) Fallen leaves.
lutescens, A. & S.—Mid. (Schw.) Limbs and leaves.
pyriformis, Fr.—Mid. (Schw.) On Mosses.
cyathoidea, Bull.—Mid. and Up. Stem of herbs.
cronata, Bull.—Mid. (Schw.) On stems.
campanula, Nees.—Mid. (Schw.) Stems of Umbelliferæ.
Buccina, Pers.—Mid. (Schw.) Wood and sticks.
corocœa, Schw.—Low. Rotting sticks.
æruginea, Fl. Dan.—Mid. and Up. On wood.
versiformis, Pers.—Up. On wood.
Agassizii, B. & C.—Up. Bark of *Abies*.
citrina, Batsch.—Common. Carious wood and limbs.
pallescentia, Pers.—Mid. (Schw.) On trunks.
eupressina, Batsch.—Low. and Mid. Leaves of Cedar.
herbarum, Pers.—Mid. (Schw.) On stems.
epiphylla, Pers.—Mid. (Schw.) Rotting leaves.
chrysocoma, Bull.—Mid. (Schw.) Pine wood.
Andropogonis, B. & C.—Low. Culms of Broom-grass.
vinosa, A. & S.—Low. and Mid. On fallen limbs.
sanguinella, B. & C.—Low. Wood and bark of *Liquidambar*.
rubella, Pers.—Low. and Mid. Carious wood and bark.
umbonata, Pers.—Mid. (Schw.) Rotting leaves.
atrovirens, Pers.—Mid. (Schw.) Rotten wood.
mitophthalma, B. & C.—Low. Bark of *Cornus florida*?
unda, Pers.—Mid. (Schw.) Trunks in low ground.
stenostoma, B. & C.—Low. Culms of *Andropogon*.
Arundinariæ, B. & C.—Low. Culms of *Arundinaria*.
fracta, B. & C.—Up. On bark of *Hydrangea*.
cinerea, Batsch.—Mid. (Schw.) Wood, limbs, &c.
Ravenelii, B. & C.—Low. On *Hysterium rufulum*.
vulgaris, Fr.—Common. Wood and bark.

- myceticola*, B. & C.—Low. Wood, Polyporus, &c.
fibriseda, B. & C.—Up. Limbs of *Ulmus Americana*.
atrata, Pers.—Common. Stems and sticks.
melaxantha, Fr.—Mid. Dry wood.
melaleuca, Fr.—Mid. (Schw.) On dry *Corylus*.
compressa, A. & S.—Common. Dry wood.
Lecideola, Fr.—Low. and Mid. Dead limbs.
flexella, Fr.—Low. Pine wood.
- CHILOROSPENIUM** *Schweinitzii*, Fr.—Low. and Mid. Carious wood.
tortum, B. & C.—Mid. (Schw.) Old wood.
- HELOTIUM** *aureum*, Pers.—Mid. (Schw.) Trunks.
aciculare, Pers.—Mid. (Schw.) Fallen limbs of *Robinia*.
- SOLENIA** *candida*, Pers.—Low. Under Pine wood.
fasciculata, Pers.—Low. and Mid. Fallen limbs in wet places.
villosa, Fr.—Low. Carious wood and bark.
ochracea, Hoffm.—Low. and Mid. Carious wood and bark.
- ASCOBOLUS** *furfuraceus*, Pers.—Low. and Mid. On cow dung.
major, B. & C.—Low. and Mid. On cow dung.
conglomeratus, Schw.—Common. On wet carious wood.
glaber, Pers.—Mid. (Schw.) On manure.
Trifolii, Bernh.—Mid. Living leaves of Clover.
- AGYRIUM** *rufum*, Fr.—Up. Wood of *Abies*.
nigricans, Fr.—Low. Dry Oak wood.
- STICTIS** *pallida*, Pers.—Mid. (Schw.) Old palings.
tenuis, Fr.—Mid. (Schw.) Bark of limbs.
radiata, Pers.—Common. Branches.
Pupula, Fr.—Low. Branches.
- LICHENOPSIS** *sphaeroboloidea*, Schw.—Common. On branchlets.
- PROPOLIS** *versicolor*, Fr.—Common. Bark of Pine, Oak, &c.
hysterina, Fr.—Low. and Mid. Dry wood.
- XYLOGRAPHIA** *parallela*, Fr.—Low. Carious wood.
- VIBRISSEA** *truncorum*, Fr.—Mid. (Schw.) On damp wood.
- BULGARIA** *globosa*, Fr.—Mid. (Schw.) Earth in woods.
inquinans, Fr.—Common. Oak logs.
sarcoides, Fr.—Mid. Rotten sticks.
rufa, Schw.—Mid. Rotten sticks in damp woods.
- DITIOLA** *gambosa*, B. & C.—Low. Wet Pine wood.
- ELAPHOMYCES** *granulatus*, Fr.—Low. Sandy woods.

SPHINCTRINA *turbinata*, Fr.—Low. On *Pertusaria*.

leucopoda, Nyl.—Low. (Tuckerm.) On trunks.

Cerasi, B. & C.—Low. and Mid. On Cherry and Peach gum.

microscopica, B. & C.—Low. Branches of *Morus multicaulis*.

minima, B. & C.—Low. Dead limbs of *Quercus*.

TROCHILA *craterium*, Fr.—Mid. Leaves of *Hedera*.

PATELLARIA *atrata*, Fr.—Common. Dry wood.

applanata, B. & C.—Common. Putrescent wood.

olivaceo-virens, Fr.—Low. and Mid. Bark and wood of *Quercus*.

stygia, B. & C.—Up. Carious wood.

sphaerospora, B. & C.—Up. Old wood.

atro-fusca, B. & C.—Low. Bark of *Vitis vulpina*.

oculata, B. & C.—Low. Limbs of *Quercus*.

discolor, Mont.—Low. Wood and stems.

rhabarbarina, Berk.—Common. Bark of *Alnus*, &c.

aureo-coccinea, B. & C.—Low. Culm and sheath of *Andropogon*.

URNULA *Craterium*, Fr.—Common. Rotten sticks in woods.

DERMATEA *fascicularis*, Fr.—Up. (Rav.) Oak limbs.

furfuracea, Fr.—Mid. (Schw.) Hazel branches.

Cerasi, Fr.—Mid. (Schw.) Cherry limbs.

carpineae, Fr.—Mid. and Up. Bark of Alder.

TYMPANIS *gyrosa*, B. & C.—Up. Bark of *Ilex prinoides*.

Viticola, Fr.—Low. and Mid. Bark of Grape-vine.

picastra, B. & C.—Up. Bark of *Ilex prinoides*.

cinerascens, Schw.—Low. On bark.

Andromedae, M. A. C.—Mid. Bark of *A. arborea*.

Fraxini, Fr.—Mid. (Schw.) Limbs of Ash.

plicato-crenata,* Fr.—Mid. (Schw.) Bark of *Prunus*.

conspersa, Fr.—Mid. (Schw.) Bark of *Pyrus*.

CENANGIUM *clavatum*, Fr.—Mid. (Schw.) Bark of *Prunus serotina*.

Prunastri, Fr.—Mid. (Schw.) On branches.

pulveraceum, Fr.—Up. On branches.

triangulare, Fr.—Common. Oak limbs.

confusum, Schw.—Mid. (Schw.) Fallen limbs of *Quercus alba*.

contortum, B. & C.—Up. Wood of Cornus.
 caliciiforme, Fr.—Mid. (Schw.) Oak trunks.
 Pinastri, Fr.—Up. Bark of Abies.
 pithyum, Fr.—Mid. (Schw.) Pine chips.
 concinnum, B. & C.—Common. Limbs of Sassafras, &c.
 Viburni, Fr.—Low. and Mid. Bark of Viburnum.
 turgidum, Fr.—Common. Exerescences of Oak limbs.
 Magnoliæ, B. & C.—Low. Bark of M. glauca.
 ? apertum, Schw.—Mid. (Schw.) Branchlets of Hy-
 drangea.
 ferruginosum, Fr.—Mid. Oak bark.
 Cephalanthi, Fr.—Common. Bark of C. occidentalis.
 Juglandis, B. & C.—Up. Bark of Walnut.
 quercinum, Fr.—Mid. (Schw.) Oak limbs.

GLONIUM stellatum, Muhl.—Mid. & Up. On stumps.

DICILENA faginea, Fr.—Common. Beech bark.

strumosa, Fr.—Common. Living Oak limbs.

RHYTISMA Asteris, Schw.—Mid. and Up. Living leaves of Aster.

Solidaginis, Schw.—Mid. and Up. Living leaves of
 Solidago.

Vitis, Schw.—Mid. Living leaves of Vitis.

acerinum, Fr.—Common. Living leaves of A. rubrum.

decolorans, Fr.—Common. Living leaves of Androm.
 lignustrina.

Vaccinii, Fr.—Common. Living leaves of Vaccinia.

Prini, Fr.—Mid. (Schw.) Living leaves of P. verticil-
 latus.

Ilicicola, Fr.—Common. Living leaves of I. prinoides.

velatum, Fr.—Mid. (Schw.) Living leaves of I. prinoides.

punctatum, Fr.—Mid. (Schw.) Living leaves of Acer
 saccharinum.

salicinum, Fr.—Low. Living leaves of Azalea.

Curtisii, B. & R.—Low. and Mid. Living leaves of Ilex
 opaca.

Cacti, Schw.—Mid. (Schw.) On rotting Opuntia.

? adglutinatum, Schw.—Common. Living branches.

PHACIDIUM dentatum, Schmidt.—Low. Dead Oak leaves.

elegans, B. & C.—Low. Sheaths and stipules of Pine.

coronatum, Fr.—Mid. (Schw.) Oak leaves.

- HYSTERIUM** pulicare, Pers.—Common. Bark and old wood.
 elongatum, Wahl.—Common. Dry wood.
 tortile, Schw.—Mid. (Schw.) Bark of Cedar.
 varium, Grev.—Low. Bark of Liquidambar.
 hiascens, B. & C.—Mid. and Up. Trunks of *Quercus*.
 Castaneæ, Schw.—Mid. (Schw.) Chestnut wood.
 lineare, Fr.—Common. On old wood.
 ellipticum, Fr.—Mid. (Schw.) On bark.
 prælongum, Schw.—Mid. (Schw.) Carious wood.
 betulignum, Schw.—Mid. Bark of Birch.
 teres, Schw.—Mid. (Schw.) Wood of *Rhododendron*.
 insidens, Schw.—Mid. (Schw.) On dried wood.
 rufulum, Fr.—Common. Bark of *Rhus*, *Melia*, &c.
 chlorinum, B. & C.—Low. Limbs of *Cyrilla*.
 depressum, B. & C.—Up. Dry wood.
 elatinum, Fr.—Mid. (Schw.) Dry wood.
 flexuosum, Schw.—Common. Various branches.
 Fraxini, Pers.—Low. Limbs of Ash.
 Vaccinii, Schw.—Mid. (Schw.) Branches of *V. frondosum*.
 Azaleæ, Schw.—Mid. (Schw.) Bark of Azalea.
 Andromedæ, Schw.—Mid. Bark of *A. axillaris*.
 Kalmiæ, Schw.—Mid. (Schw.) Wood of *K. latifolia*.
 Smilacis, Schw.—Common. On Bamboo.
 Rubi, Pers.—Common. Blackberry stems.
 Pinastri, Schrad.—Common. Pine leaves.
 commune, Fr.—Common. Dead stems.
 plantarum, Schw.—Mid. (Schw.) On *Monotropa*.
 variegatum, B. & C.—Low. and Mid. Petioles and nerves of Oak leaves.
 arundinaceum, Schrad.—Mid. (Schw.) Culm of Reed.
 maculare, Fr.—Low. Oak leaves.
 follicolum, Fr.—Low. and Mid. Leaves of Oak and *Andromeda*.
 petiolare, A. & S.—Mid. On petioles.
LABRELLA Pomi, Mont.—Common. Skin of Apples.
CORDYCEPS militaris, (Ehrh.)—Common. On chrysalids.
 entomorhiza, (Dicks.)—Common. On dead larvæ.
 Gryllotalpæ—M. A. C.—Low. On buried Sand-moles.

Carolinensis, B. & R.—Low. On chrysalids.

Ophioglossoides, (Ehrh.)—Mid. Earth in woods.

capitata, (Holmsk.)—Low. On *Elaphomyces*.

alutacea, (Pers.)—Mid. (Schw.) Earth.

armeniaca, B. & C.—Low. Bird excrement in wet ground.

mucronata, (Schw.)—Mid. (Schw.) Trunk of *Liriodendron*.

Isarioides, M. A. C.—Mid. On dead moths.

XYLARIA *polymorpha*, (Pers.)—Mid. Rotten stumps and wood.

corniformis, Fr.—Low. and Mid. Putrescent sticks.

digitata, (Ehrh.)—Mid. Base of trunks.

Hypoxylon, (Ehrh.)—Common. Bark and wood.

Cornu-damæ, (Schw.)—Low. Rotten logs.

persicaria, (Schw.)—Low. & Mid. Buried Peach-stones.

carpophila, (Pers.)—Low. and Mid. Dead burs of *Liquidambar*.

filiformis, (A. & S.)—Low. Rotting leaves and petioles.

RHIZOMORPHA *subcorticalis*, Pers.—Common. Between bark and wood of logs.

PORONIA *candida*, Schw.—Mid. (Schw.) Limbs of *Fraxinus*.

HYPOCREA *tomentosa*, Fr.—Low. On *Lactarius*.

lateritia, Fr.—Mid. On *L. Indigo*.

Lactifluorum, (Schw.)—Common. On *Lactarius*.

hyalina, (Schw.)—Mid. (Schw.) On *Russula*.

luteo-virens, Fr.—Mid. (Schw.) On *Agarics*.

citrina, (Pers.)—Common. Bark, wood, &c.

rosea, (Pers.)—Mid. (Schw.) On roots of trees.

gelatinosa, (Tode.)—Common. On wood, &c.

chlorospora, B. & C.—Mts. Putrid wood.

Stereorum, (Schw.)—Mid. On *Polyporus Curtisii*.

rufa, (Pers.)—Common. Wood, &c.

tuberiformis, B. & R.—Low. Culms of *Arundinaria*.

subviridis, B. & C.—Low. Dead grass leaves.

atramentaria, B. & C.—Low. Living leaves of *Eragrost* :
hirsuta.

HYPOXYLON *ustulatum*, Bull.—Common. Trunks and stumps.

Tubulina, (A. & S.)—Mid. (Schw.) Trunk of Walnut.

nummularium, Bull.—Common. Bark of *Acer*, *Platanus*, &c.

punctulatum, B. & R.—Low. Bark of dead Oaks.

Clypeus, (Schw.)—Low. & Mid. Bark of *Quercus nigra*.

nesodes, B. & C.—Low. Fallen limbs.

concentricum, (Bolt.)—Common. Trunks & stumps.

vernicosum, (Schw.)—Common. Wood and bark

rubricosum, Fr.—Low. On bark.

xanthocreas, B. & C.—Low. On *Alnus*.

multiforme, Fr.—Common. Wood and bark.

annulatum, (Schw.)—Common. On bark.

decorticatum, (Schw.)—Low. Bark of *Sassafras*.

epiphæum, B. & C.—Low. Sticks of *Magnol. glauca*

colæarens, (Pers.)—Mid. and Up. Bark of trunks.

notatum, B. & C.—Low. Fallen Oak limbs.

fuscum, (Pers.)—Common. Dead limbs.

fragiforme, (Pers.)—Mid. and Up. On bark.

rubiginosum, (Pers.)—Mid. Carious wood.

perforatum, (Schw.)—Common. Bark and wood.

illitum, (Schw.)—Mid. (Schw.) Wood of *Cornus*, &c.

serpens, (Pers.)—Common. Carious wood.

leucocreas, B. & R.—Low. Carious wood.

colliculosum, (Schw.)—Mid. (Schw.) Oak trunks.

coprophilum, Fr.—Common. On cow dung.

nudum, Fr.—Mid. (Schw.) Oak limbs.

Sassafras, (Schw.)—Common. Bark of *Sassafras*.

atramentosum, (Fr.)—Mid. (Schw.) Old wood.

afflatum, (Schw.)—Mid. (Schw.) Dry wood.

exaratum, (Schw.)—Mid. (Schw.) Limbs of *Carya*.

fuscopurpureum, (Schw.)—Mid. (Schw.). Wood and bark.

grègale, (Schw.)—Mid. (Schw.) Putrid wood.

investiens, (Schw.)—Low. and Mid. On Wood.

DIATRYPE *rigens*, (Fr.)—Mid. (Schw.) On wood.

contorta, (Schw.)—Common. On bark.

microplaca, B. & C.—Low. Limbs of *Benzoin*.

stigma, Fr.—Common. Bark and wood.

platystoma, (Schw.)—Mid. On bark.

atropunctata, (Schw.)—Common. Dead trunks.

disciformis, Fr.—Mid.—Bark of Alder.

Robiniae, (Schw.)—Mid. (Schw.) Bark of Locust.

virescens, (Schw.)—Common. Limbs of Fagus.

Duriæi, Mont.—Low. Fallen limbs.

asterostoma, B. & C.—Low. Fallen limbs.

favacea, Fr.—Mid. (Schw.) Birch wood.

Smilacicola, (Schw.)—Low. and Mid. On Smilax.

verrucæformis, Fr.—Common. On dead limbs.

subfulva, B. & C.—Low. Dead limbs of Nyssa.

obesa, B. & C.—Common. Bark of Rhus, &c.

discincola, (Schw.)—Mid. (Schw.) Disc of stump of Malus.

discreta, (Schw.)—Low. and Mid. Bark of Malus.

Ribesia, (Schw.)—Mid. (Schw.) On R. rubrum.

friabilis, (Pers.)—Mid. (Schw.) Bark of Ilex prinoides, &c.

quercina, Fr.—Mid. (Schw.) Oak limbs.

Hystrix, Fr.—Mid. (Schw.) On Maple.

strumella, Fr.—Mts. On Grossularia.

insitiva, Fr.—Mid. (Schw.) On Vitis.

innata, B. & C.—Mts. Branches of Castanea.

leioplaca, Fr.—Low. Branches of Cyrilla.

lata, Fr.—Common. Bark and Dry wood.

Polynesia, B. & C.—Mts. Dry wood of trunks.

Diospyri, (Schw.)—Mid. (Schw.) Bark of Persimmon.

Viticola, (Schw.)—Low. and Mid. On Vitis.

æquilinearis, (Schw.)—Mid. (Schw.) Limbs of Berberis.

fineti, (Pers.)—Mid. (Schw.) On manure.

TORSELLIA Sacculus, (Schw.)—Mid. (Schw.) Bark of Tecoma.

VALSA (I. CIRCUMSCRIPTÆ.)

prunastri, Fr.—Mid. (Schw.) On Prunus serotina.

plagia, B. & C.—Low. Fallen limbs of Liriodendron.

gastrina, Fr.—Up. Oak limbs.

stellulata, Fr.—Common. Bark of limbs.

Bignoniæ, (Schw.)—Mid. (Schw.) Bark of Tecoma.

scoparia, (Schw.)—Mid. (Schw.) Bark of Walnut.

enteroleuca, Fr.—Mid. Bark of Robinia limbs.

syngenesia, Fr.—Mid. (Schw.) On *Rubus strigosus*.
 pugillus, (Schw.)—Mid. (Schw.) Wood of Maple.
 corniculata, (Ehrh.)—Low. and Mid. Bark of Ash, &c.
 haustellata, (Fr.)—Low. Bark of Oak, Alder, &c.
 fibrosa, Fr.—Mts. Branches of *Alnus*?
 Leaiana, (Berk.)—Mid. (Schw.) In *Carpinus*.
 frustum-coni, (Schw.)—Mid. Roots of Oak.

(II. INCUSÆ.)

nivea, Fr.—Mid. (Schw.) Bark of Apple tree.
 leucostoma, Fr.—Common. Bark of *Prunus* and *Persica*.
 sentellata, (Pers.)—Mid. (Schw.) On *Prunus* and *Cornus*.
 taleola, Fr.—Low. Oak limbs.
 angulata, Fr.—Mid. Holly limbs.
 tessella, Fr.—Mid. (Schw.) Willow limbs.

(III. OBVALLATÆ.)

ciliata, Fr.—Mid. (Schw.) Bark of Eln.
 coronata, Fr.—Mid. and Up. On *Castanea* and *Bignonia*
 branches.
 Notarisii, Mont.—Mid. Branches of *Gleditschia*.
 decorticans, Fr.—Low. Bark of *Kerria Japonica*.
 Liquidambaris, (Schw.)—Mid. (Schw.) Young limbs of
 Sweet Gum.
 leiphæmia, Fr.—Low. and Mid. Branches of Oak.
 turgida, Fr.—Mid. (Schw.) Branches of *Liriodendron*.
 subscripta, Fr.—Low. Branches of *Melia*.
 salicina, Fr.—Mid. Branches of Willow.
 pusio, B. & C.—Low. Branches of *Morus multicaulis*.
 Vitis, (Schw.)—Common. Bark of Grape vines.
 capsularis, (Pers.)—Mts. (Schw.) Bark of *Ampelopsis*.
 stilbostoma, Fr.—Common. Various branches.
 tubulosa, B. & C.—Low. Branches of *Alnus*.
 Americana, B. & C.—Common. On various branches.
 gonistoma, (Schw.)—Common. On various branches.
 ambiens, Fr.—Common. On various branches.

IV. CIRCINATÆ.)

pulchella, Fr.—Common. Bark of Cherry, Oak, &c.
 quaternata, Fr.—Common. Bark of *Acer*, &c.

præstans, B. & C.—Mid. Branches of *Nyssa*.
umbilicata, (Pers.)—Mid. (Schw.) Branches of *Lonicera*
sempervirens,
condensata, B. & C.—Mts. Branches of *Querc: montana*.
castanophila, B. & C.—Mts. Branches of *Castanea*.
acclinis, Fr.—Mid. (Schw.) Branches of *Sassafras*.
rufescens, (Schw.)—Common. Branches of *Rhus*.
divergens, (Schw.)—Mid. (Schw.) Fallen limbs of *Liquidambar*.

MELOGRAMMA *Quercuum*, Fr.—Common. Limbs of Oaks.
campylosporum, Fr.—Mid. (Schw.) Trunks of *Acer*.
Castaneæ, (Schw.)—Mid. (Schw.) Bark of Chestnut.
gyrosum, (Schw.)—Com. Bark of Oak, Beech, &c.
Calycanthi, (Schw.)—Low. and Mid. Bark of Sweet
 Shrub.
Gleditschiæ, (Schw.)—Mid. Limbs of Honey Locust.
rhizogena, (Berk.)—Low. and Mid. Bark of *H. Syriacus*.
Hibisci, (Schw.)—Low. Bark of *H. Syriacus*.
Araliæ, M. A. C.—Mid. Bark of *A. spinosa*.
Phoradendri, B. & C.—Low. Dead branches of *P.*
flavescens.
ambiguum, (Schw.)—Common. Dead branches of
Rhus.
Meliæ, (Schw.)—Low. and Mid. Dead branches of
 China Tree.
atrofusum, B. & C.—Mts. Dead branches of *Rhus*
glabrum.
Persimmons, (Schw.)—Mid. (Schw.) Dead branches
 of *Diospyrus*.

NECTRIA *cinnabarina*, Fr.—Common. Dead branches of various
 trees.
dematiota, (Schw.)—Low. and Mid. Dead branches of
Morus rubra.
coccinea, Fr.—Common. Dead branches of various trees.
Cucurbitula, Fr.—Low. and Mid. Dead branches of
Prunus, *Melia*, &c.
diploa, B. & C.—Low. Dead branches of *Alnus*, &c.
perpusilla, B. & C.—Low. Stem of *Lycopersicum*, &c.

Curtisii, Berk.—Low. Dead stalk of *Zea*.
muscivora, Berk.—Low. On *Jungermannia* upon trunks.
polythalamia, B. & R.—Common. Bark of *Fraxinus*, &c.
Peziza, Fr.—Common. Bark and wood.
sanguinea, Fr.—Common. Wood and *Sphæriæ*.
episphæria, Fr.—Common. On *Hypoxyla*.
ochroleuca, (Schw.)—Mid. (Schw.) Various trees.
molliuscula, (Schw.)—Mid. (Schw.) Carious wood.
ordinata, (D. C. ?)—Mid. (Schw.) Carious wood.
aurantia, Fr.—Low. and Mid. On bark and *Polyporus*.
rosella, Fr.—Mid. (Schw.) Earth under putrid logs.
Tegillum, B. & C.—Low. Underside of Pine wood.
? pannosa, (Schw.)—Mid. (Schw.) Under rotten log.

SPIRERIA (I. SUPERFICIALES.)

a. Byssisedæ.

aquila, Fr.—Common. Dejected limbs in woods.
Corticium, Schw.—Common. Bark of Oak and Chestnut.
byssiseda, Tode.—Mid. (Schw.) Branches of trees.
subicnata, Schw.—Common. Carious wood.
xestothele, B. & C.—Low. Limbs of *Cornus florida*.
culcitella, B. & R.—Low. Bark and wood of *Quercus*.
confertula, Schw.—Common. Bark of *Fraxinus*, *Laurus*,
 &c.
callista, B. & C.—Common. Bark of *Carpinus*, &c.
parietalis, B. & C.—Low. Within hollow Oak trunk.
Pezizula, B. & C.—Low. & Mid. Bark of *Liquidambar*, &c.
lanuginosa, B. & C.—Low. Naked limbs of *Robinia*.
rhodomphala, Berk.—Common. On wood.
Collinsii, Schw.—Mid. Leaves of *Mespilus*, &c.
cinerea, Pers.—Mid. (Schw.) Cow dung.
phæostroma, Mont.—Mid. (Schw.) Limbs and sticks.
rhodomela, Fr.—Mid. (Schw.) Old wood.

b. Villosæ.

cvina, Pers.—Mid. (Schw.) Dry wood.
nudicollis, B. & C.—Low. Putrescent Pine trunk.
mutabilis, Pers.—Mid. Bark of *Cerasus*.
canescens, Pers.—Low. Dry wood.
ciria, B. & C.—Low. On *Diatrype stigma*.

strigosa, A. & S.—Low. & Mid. Dry wood of *Kalmia*, &c.
Racodium, Pers.—Low. & Mid. Bark of *Liquidambar*, &c.
crinita, Pers.—Mid. (Schw.) Carious wood of *Beech*, &c.
araneosa, Pers?—Mid. (Schw.) Dry wood.
lignaria, Grev.—Common. Dry wood.
agminalis, B. & C.—Low. and Up. Dry Pine wood.
vermicularia, Nees.—Low. Dry Pine wood.
phæosticta, Berk.—Low. Leaves & sheaths of *Andropogon*.
exilis, A. & S.—Low. Bark of *Cornus florida*.
pilosa, Pers.—Low. Pine wood.
orthotricha, B. & C.—Low. Within hollow *Nyssa*.
squamulata, Schw.—Mid. (Schw.) Carious wood.
terebrata, B. & C.—Low. Wood of fallen Oak limbs.
flavido-compta, B. & C.—Low. Wood of *Cyrilla*.

c. *Denudatæ*.

seriata, Pers.—Mid. (Schw.) In cracks of wood.
pomiformis, Pers.—Low. Culms of *Arundinaria*.
mammæformis, Pers.—Low. and Mid. Fallen limbs of
Oak, *Beech*, &c.
rhodospila, B. & C.—Low. Dry wood of *Cyrilla*.
moriformis, Tode.—Common. Old wood.
pulvis-pyrius, Pers.—Low. and Mid. Oak limbs.
spermoides, Hoffm.—Mid. (Schw.) On wood.
multifera, B. & R.—Mid. (Schw.) On manure.
millegrana, Schw.—Low. & Mid. Dry wood and bark.
epimelæna, B. & C.—Low. Carious Pine wood.
myriocarpa, Fr.—Common. Dry wood.
ootheca, B. & C.—Low. and Mid. Carious wood.
notha, Schw.—Mid. (Schw.) On cut wood.
disseminata, B. & C.—Low. Old wood of *Liquidambar*.

d. *Pertusæ*.

lecythea, Schw.—Mid. (Schw.) Carious wood.
mobilis, Tode.—Mid. (Schw.) Oak limbs.
Curtisii, B.—Low. Decayed nuts of *Carya*.
Putatinum, Schw.—Low. and Mid. Old Peach stones.
psoriella, B. & C.—Low. Bark on trunks of *Platanus*.
papilla, Schw.—Low. and Mid. Fallen bark and wood.
mycophila, Fr.—Low. On *Polyporus Curtisii*.

porothelia, B. & C.—Low. On hymenium of Stereum.
kalospora, B. & C.—Low. Denuded limbs of Fraxinus?
mastoidea, Fr.—Low. and Mid. Limbs of Fraxinus, &c.
seminuda, Pers.—Mid. (Schw.) Wood and bark.
ulmaticolor, B. & C.—Low. Decorticated sticks.
Cyrillæcola, B. & C.—Low. Carious wood of Cyrilla.
porphyrostoma, Kze?—Mid. (Schw.) On wood.
latericolla, D. C.—Low. Denuded sticks.
pertusa, Pers.—Low. and Mid. Old wood.
caryophaga, Schw.—Low. Old nuts of Carya.
Pericarpiccola, B. & C.—Low. Pericarp of Hickory nuts.
sporædema, B. & C.—Low. Dead wood of Acer.
fissurarum, B. & C.—Low. In chinks of Pine wood.
Aethiops, B. & C.—Up. Dry wood.

(II. ERUMPENTES.)

e. Cæspitosæ.

Ribis, Tode.—Mid. (Schw.) Branches of *R. rubrum*.
acervata, Fr.—Mid. (Schw.) On Oak.
Berberidis, Pers.—Mid. On Barberry.
varia, Pers.—Mid. (Schw.) Limbs of *Cerasus*.
subcongregata, B. & C.—Common. Bark of *Morus*, *Liquidambar*, &c.
nobilis, B. & C.—Up. Branchlets of *Tilia glabra*.
morboza, Schw.—Common. Limbs of Plum and Cherry.
Perisporioides, B. & C.—Common. Living leaves of
Rhynchosia, &c.
pulicaris, Fr.—Low. and Mid. Branches and stems.
Saubineti, Mont.—Low. and Mid. On culms of *Zea*.
Hyperici, Schw.—Low. On *H. fruticosum*.

f. Obturatæ.

elongata, Fr.—Common. Limbs of *Robinia*, &c.
nuntia, Fr.—Common. Bark of dead limbs.
insidens, Schw.—Mid. (Schw.) Wood and bark.
Virginica, B. & C.—Mid. and Up. Wood of *Castanea*, &c.
abrupta, B. & C.—Low. Dead root of *Cyrilla*?
Ennotea, B. & C.—Mid. Dead *Hedera*.
conostoma, B. & C.—Low. Limbs of *Persica*.
effusa, B. & C.—Low. Wood of *Quercus alba*.

fissa, Pers.—Mid. (Schw.) On Rosa.

mucosa, Pers.—Mid. (Schw.) On Cucurbita.

Cupressi, B. & C.—Low. Limbs of C. thyoides.

Opuli, B. & C.—Low. Limbs of V. Opulus.

Sclerotium, Schw.—Mid. (Schw.) Limbs of Hydrangea.?

Lonicerae, Sow.?—Mid. Branches of *Lonicera sempervirens*.

Clasterium, B. & C.—Mts. Branches of *Spiraea opulifolia*.

orthospora, B. & C.—Mts. Branches of *Sambucus Canadensis*.

Tecomatis, B. & C.—Low. Branches of *Tecoma radicans*.

semitecta, B. & C.—Mts. Branches of *Platanus*.

strobilina, Holl. & Sm.—Low. Old Pine cones.

Pteridicola, B. & C.—Low. Stipes of *P. aquilina*.

Zeae, Schw.—Low. and Mid. On old corn stalks.

eumorpha, B. & C.—Low. Culms of *Arundinaria*.

apiospora, Mont.—Low. and Mid. Culms of *Arundinaria*.

arundinacea, Sow.—Low. Stems of *Arundo*.

longissima, Pers.—Common. On stems of herbs.

Anethi, Pers.—Mid. (Schw.) On stems of herbs.

nebulosa, Pers.—Common. On stems of herbs.

picea, Pers.—Mid. (Schw.) On stems of herbs.

g. Confertæ.

Graminis, Pers.—Common. Grass leaves.

Scirporum, Schw.—Mid. (Schw.) Leaves of *S. Americanus*.

ulmea, Schw.—Common. Leaves of *U. Americana*.

Peltigeræ, Mont.—Up. On *Parmelia*.

Lespedezæ, Schw.—Mid. and Up. Leaves of *Lespedeza*.

Yuccæ, Schw.—Low. (Schw.) Leaves of *Y. gloriosa*.

h. Lophiostomæ.

angustata, Pers.—Mid. On hard wood.

pileata, Tode.—Mid. (Schw.) Carious wood of *Liquidambar*.

excipuliformis, Fr.—Mid. (Schw.) Limbs of *Negundo*.

compressa, Pers.?—Mid. Roots of *Quercus*.

hysterioides, Schw.—Up. Wood of *Tilia*.

Arundinis, Fr.—Low. Culm of *Arundinaria*.

i. Ceratostomæ.

pilifera, Fr.—Low. and Mid. Dry Pine wood.

rostrata, Fr.—Low. Carious wood and bark.
 Sphærincola, Schw.—Mid. (Schw.) On Hypoxylon Clypeus.
 stricta, Pers.—Mid. (Schw.) Wood of Robinia, &c.
 cirrhosa, Pers.—Mid. (Schw.) Putrid wood.
 mucronata, Marke.—Mid. (Schw.) On wood.
 brevirostris, Fr.—Low. On soft wood.
 assecla, Schw.—Mid. Bark of Liriodendron, &c.

(III. SUBTECTÆ.)

k. Immersæ.

spinosa, Pers.—Mid. and Up. On wood.
 limæformis, Schw.—Mid. Bark of Oak and Chestnut.
 tuberculosa, Schw.—Mid. (Schw.) Carious wood of Betula.
 fineti, Pers.—Mid. On manure.
 livida, Fr.—Mid. and Up. Dry wood.
 rhodoglossa, B. & C.—Mid. Branchlets of Negundo.
 rhodina, B. & C.—Low. Branchlets of Rosa.
 obtecta, Schw.—Mid. (Schw.) Branches of shrubs.
 sepelita, B. & C.—Low. Stem of Smilax laurifolia.
 peliospora, B. & C.—Mts. On Acer spicatum.
 disrupta, B. & C.—Low. Stem of Smilax.
 flavitecta, B. & C.—Low. Branches of Kerria Japonica.
 citrispora, B. & C.—Mts. Branches of Tilia glabra.
 Tiliæ, Pers.—Mid. (Schw.) Branches of Tilia, &c.
 sæpincola, Fr.—Up. On Spiræa opulifolia.
 clypeolus, M. A. C.—Mid. Branches of Fraxinus.
 olivæspora, B. & C.—Low. Branchlets of Cornus florida.
 subclypeata, B. & C.—Mid. (Schw.) On bark of Rosa and Rubus.
 fuscella, B. & Br.—Up. and Mid. On bark of Rosa.
 velata, Pers.—Mid. (Schw.) On limbs of Tilia.
 Dioscoreæ, B. & C.—Low. Dead stems of Dioscorea.
 epidermidis, Fr.—Low. Limbs of Persica.
 aculeata, Schw.—Common. Stems of herbs.
 combulliens, B. & C.—Low. Stems of Arundinaria.
 incarcerationata, B. & C.—Low. Stems of Spartina glabra.
 Cacti, Schw.—Mid. (Schw.) On dead Opuntia.
 nigro-annulata, B. & C.—Low. Leaves of Yucca aloifolia.

Ilicis, Schleich.—Common. Leaves of *I. opaca*.
Pustula, Pers.—Mid. (Schw.) Leaves of *Juglans*.
Pseudo-pustula, B. & C.—Low. Fallen leaves of *Nyssa*
 mult:
Kalmiarum, Schw.—Mid. Dead leaves of *Kalmia*.
sparsa, B. & C.—Mid. Fallen leaves.
Andromedarum, Schw.—Mid (Schw.) Dead leaves of *A.*
axillaris.
argyrostoma, Berk.—Low. and Mid. Leaves of *Yucca*
filamentosa.

1. Obtectæ.

pruinosa, Fr.—Mid. and Up. Limbs of *Fraxinus*.
salicella, Fr.—Up. Limbs of *Cornus sericea*.
sarcocystis, B. & C.—Mid. Dead stems of *Cerealia*.
rubella, Pers.—Low. and Mid. Dead stems of herbs and
 grasses.
rubicunda, Schw.—Mid. (Schw.) Dead stems of *Solanum*, &c.
acuminata, Sow.—Up. and Mid.—Dead stems of Herbs.
complanata, Tode.—Mid. and Up. Dead stems of Herbs.
coniformis, Fr.—Mid. and Up. Dead stems and herbs.
doliolum, Pers.—Common. Dead stems and herbs.
ceratispora, B. & C.—Low. Dead stems and herbs.
nigrella, Fr.—Mid. Dead stems of *Ambrosia trifida*.
herbarum, Fr.—Common. Dead stems of herbs and grasses.
Verbascicola, Schw.—Low. and Mid. Dead stems of *V.*
Thapsus.
ampliata, Schw.—Mid. (Schw.) Dead stems of Umbel-
 liferæ.
Ogilviensis, Berk. ?—Up. Dead stems of *Cimicifuga*, &c.
Plantaginis, B. & C.—Mid. Calyx and rachis of *P. major*.
Oenotheræ, B. & C.—Low. Dead stem of *O. sinuata*.
umbrinella, B. & C.—Low. Base of stem of *Eupator*:
 cornop:
stictostoma, B. & C.—Up. Stem of *Eupatorium*.
Scorodoniæ, B. & C.—Low. Stem of *Allium* in gardens.
mescedema, B. & C.—Low. Stem of *Cirsium* and *Eupa-*
torium.
incommiscibilis, B. & C.—Up. Stem of dead herb.

m. Foliicolæ.

Sarraceniae, Schw.—Low. and Mid. Leaves of *Sarracenia*.
 tubæformis, Tode.—Mid. (Schw.) Leaves of Elm and
 Tulip Tree.

Gnomon, Tode.—Mid. (Schw.) Leaves of Chinquapin.
 setacea, Pers.—Mid. (Schw.) Leaves of Birch.

Solani, Pers.—Mid. (Schw.) Tubers of *Solanum*.

petiolorum, Schw.—Low. and Mid. Petioles of *Liquidambar*, &c.

pyramidalis, Schw.—Mid. (Schw.) On leaves.

Potentillæ, Schw.—Mid. and Up. Leaves of *P. Canadensis*.

Solidaginum, Schw.—Mid. Leaves of *Solidago*.
 myriadea, D. C.—Common. Leaves of Oaks, &c.

maculæformis, Pers.—Common. Various leaves.

punctiformis, Pers.—Common. Various leaves.

Magnoliae, Schw.—Low. Leaves of *M. glauca*.

fructuosa, B. & C.—Low. Leaves of Magnol; grandifl.

Andromedæ, Schw.—Low. and Mid. Leaves of *A. coriacea*, &c.

Carectorum, B. & C.—Low. Leaves of *Carex xanthophylla*.

MASSARIA crustata, Fr.—Mid. (Schw.) On limbs.

obesa, B. & C.—Low. Fallen limbs of *Acer* and *Quercus*.

atroinquinans, B. & C.—Low. Fallen limbs of *Platanus*.

?excussa, (Schw.)—Mid. (Schw.) On limbs.

epileuca, B. & C.—Low. and Mid. Limbs of *Morus rubra*.

seiridia, B. & C.—Mts. Limbs of *Robinia*.

vomitorea, B. & C.—Low. and Mid. Limbs of *Acer*.

circumscissa, (Pers.)—Mid. (Schw.) On *Platanus*.

DEPAZEA Smilacicola, Schw.—Common. Leaves of *Smilax*.

Kalmicola, Schw.—Mid. and Up. Leaves of *K. latifolia*.

Hederæcola, Fr.—Mid. Leaves of *H. Helix*.

Tulipiferae, Schw.—Low. Leaves of Tulip Tree.

brunnea, B. & C.—Low. Living leaves of *Acer*.

cruenta, Fr.—Mid. and Up. Dying leaves of *Convallaria*.

Carpinicola, Fr.—Mid. (Schw.) Leaves of Hornbeam.

DOTHIDEA.—a. Denudatæ.

Glumarum, B. & C.—Mid. Fallen heads of Wheat.

b. Erumpentes.

Ribesia, Fr.—Mid. (Schw.) On Ribes.

Sambuci, Fr.—Mid. (Schw.) On Elder.

sphærioides, Fr.—Mid. (Schw.) On Populus Italica.

Capreolatæ, Schw.—Low. and Mid. Branches of Bignonia.

Rhuina, Schw.—Mid. (Schw.) Young branches of R. radicans.

c. Xyloma.

typhina, Fr.—Low. and Mid. Culms of living Grass.

rubra, Fr.—Mid. (Schw.) Leaves of Prunus.

flabella, B. & C.—Low. Fronds of Pteris aquilina.

Heliopsidis, Schw.—Mid. (Schw.) Stem and branches of H. lævis.

Eupatorii, B. & C.—Mid. Stem of E. coronopifolia.

Smilacis, B. & C.—Up. Branches of Smilax.

asteromorpha, Schw.—Mid. (Schw.) Living leaves of Betula.

Brachystemonis, Schw.—Mid. (Schw.) Living leaves of Pycnanthemum.

culmicola, Schw.—Mid. (Schw.) Fallen stems of Grass.

exasperans, Schw.—Mid. (Schw.) Leaves and petioles of herbs.

Catalpæ, B. & C.—Low. Fallen leaves of Catalpa.

Ambrosiæ, B. & C.—Low. Living leaves of A. artemesiæf.

orbicularis, B. & C.—Low. Living leaves of Gentiana Saponaria.

Anemones, Fr.—Mid. Living leaves of A. Virginica.

alnea, Fr.—Low. and Mid. Leaves of Alnus.

PERISPORIUM fimeti, B. & C.—Low. Rabbit excrements.

Caladii, Schw.—Mid. (Schw.) On Peltandra.

ERYSIPHE communis, Schlecht.—Common. Living leaves.

horridula, Lev.—Low. Living leaves of Xanthium.

Martii, Lev.—Up. Living leaves of Eupator. ageratoides.

Gerardiæ, Schw.—Mid. (Schw.) Living leaves of G. quercifolia.

MICROSPILERA penicillata, Lev.—Common. Living leaves.

Ravenelii, B. & C.—Common. Living leaves of *Gleditschia*.

semitorta, B. & C.—Low. Living leaves of *Cephalanthus*.

Friesii, Lev.—Low. Living leaves of *Syringa vulgaris*.

Hedwigii, Lev.—Low. Living leaves of *Quercus aquatica*.

PHYLLACTINIA guttata, Lev.—Common. Living leaves of *Alnus*, &c.

PODOSPIRERIA Kunzei, Lev.—Mid. Leaves of *Cerasus*.

UNCINULA adunca, Lev.—Common. Living leaves.

polychæta, B. & C.—Mid. & Up. Living leaves of *Celtis*.

CHÆTOMIUM elatum, Kze.—Low. & Mid. Putrescent grass stems.

chartarum, Ehrb.—Low. On wet paper.

MELIOLA amphitricha, Fr.—Common. Leaves and twigs.

ASTERINA spuria, B. & C.—Low. Leaves and stem of *Hyptis*.

Erysiphoides, B. & C.—Low. Leaves of *Nyssa multiflora*.

exasperans, B. & C.—Mid. (Schw.) Leaves of *Kalmia latifolia*.

orbicularis, B. & C.—Low. and Mid. Leaves of *Ilex* and *Prinos*.

SCORIAS spongiosa, Fr.—Common. Leaves and limbs of *Fagus* and *Alnus*.

CARPONIDIUM elongatum, B. & D.—Low. and Mid. On various leaves.

Carolinense, B. & D.—Low. Fallen leaves of Post Oak.

ONYGENA equina, Pers.—Mid. (Schw.) Old horns and hoofs.

faginea, Fr.—Common. Dead bark of Beech.

VI. PHYSOMYCETES.

- Mucor flavidus*, Pers.—Mid. (Schw.) On Agarics.
Mucedo, L.—Low. and Mid. On putrescent matter.
caninus, Pers.—Mid. (Schw.) Excrement of Mice.
fusiger, Lk.—Low. On Agarics.
capitato-ramosus, Schw.—Low. On putrescent Boleti.
clavatus, Lk.—Low. On putrescent Cucurbita.
curtus, B. & C.—Low. On putrescent C. Melo.
HYDROPHORA tenella, Tode.—Mid. (Schw.) On sticks.
 murina, Fr.—Mid. (Schw.) On squirrel excrements.
 Fimbria, Fr.—Mid. (Schw.) On Sphæriæ.
PHYCOMYCES nitens, Kze.—Low. On dung in wet ground.
ASCOPIORA Mucedo, Tode.—Mid. On putrescent bodies.
 nucum, Cda.—Low. Putrescent Batatas tubers.
 chartarum, B. & C.—Low. On damp paper.
PILOBOLUS roridus, Pers.—Mid. (Schw.) Horse dung.
 crystallinus, Tode.—Low. Horse dung.
EUROTIUM herbariorum, Lk.—Common. On dried plants.
AEGERITA candida, Pers.—Low. and Mid. Putrescent vegetation.
 cæsia, Pers.—Mid. (Schw.) On trunks.
 ovula, Schw.—Mid. (Schw.) Carious wood.
DICHOSPORIUM aggregatum, Nees.—Mid. (Schw.) Oak bark.

GENERA DUBIA.

- ECTOSTROMA Liriodendri*, Fr.—Common. Leaves of Tulip Tree.
 Toxici, Schw.—Mid. (Schw.) Leaves of Poison vine.
 afflatum, Fr.—Mid. Leaves of Cimicifuga.
 Annoneæ, Fr.—Mid. (Schw.) Leaves of Asimina.
ERINEUM fagineum, Pers.—Common. Leaves of Beech.
 acerinum, Pers.—Common. Leaves of Maple.
 luteolum, Kze.—Low. and Mid. Leaves of Maple.

roscum, Schulz.—Mid. (Schw.) Leaves of Birch.
 Vitis, D. C.—Low. and Mid. Leaves of Grape.
 Ilicium, D. C.—Low. Leaves of Scrub Oak.
 quercinum, Kze.—Mid. Leaves of Black Oak.
 Quercus-cinerea, Schw.—Low. Leaves of Upland Willow
 Oak.

Pyracanthæ, Lk.—Mts. Leaves of *Cratægus punctata*.
 Cyrillæ, B. & C.—Low. Leaves of *Cyrilla*.
 anomalum, Schw.—Low. Limbs and petioles of *Juglans*
 and *Carya*.

SPERMOEDIA Clavus, Fr.—Low. On Grass seeds.

Paspali, Fr.—Low. and Mid. Seeds of *Paspalum*.

Tripsaci, M. A. C.—Mid. Seeds of *T. dactyloides*.

PACHYMA Cocos, Fr. (Tuckahoe.)—Low. and Mid. Under ground.

SCLEROTIUM complanatum, Tode.—Mid. Putrescent leaves.

scutellatum, A. & S.—Mid. (Schw.) Leaves of *Juglans*.

Semen, Tode.—Low. and Mid. Leaves of *Iris*, &c.

Arundinariæ, B. & C.—Low. Leaves of *Arundinaria*.

vulgatum, Fr.—Mid. (Schw.) Putrescent vegetation.

Fungorum, Pers.—Low. On roots of Mosses.

Medicaginis, Fr.—Low. On buried radicles.

truncorum, Fr.—Low. Putrid wood.

Circææ, Schum.—Mid. (Schw.) Leaves of *Circæa*.

applanatum, Schw.—Mid. (Schw.) Limbs of *Castanea*.

cerebrinum, B. & C.—Low. Fallen limbs in wet
 ground.

Orobanches, Schw.—Mid. (Schw.) Root and stem of
O. Virginica.

varium, Pers.—Mid. Earth and old cabbage stalks.

nitidum, B. & C.—Low. Fallen rose petals.

pyrinum, Fr.—Low. On old dried Apples.

Malorum, Berk.—Low. On old dried Apples.

durum, Pers.—Mid. (Schw.) Stem of herbs.

Liliorum, Schw.—Mid. (Schw.) Stem of *Lilium*.

Pustulla, Fr.—Low. and Mid. Oak leaves.

populinum, Pers.—Mid. (Schw.) Poplar leaves.

RHIZOCTONIA Muscorum, Fr.—Mid. (Schw.) Roots of Mosses.

Ilmiantia, Schw.—Mid. (Schw.) Lignous earth.

OZONIUM auricomum, Lk.—Common. Old logs.

CHARACEÆ.

- CHARA fragilis, Desv.—Low. and Mid. Ponds and ditches.
 Schweinitzii, A. Braun.—Mid. Still streams.

ALGÆ. OR SEA-WEEDS.

MELANOSPERMEÆ.

- SARGASSUM vulgare, Ag.—In the Gulf Stream.
 bacciferum, Ag.—In the Gulf Stream.
 Fucus vesiculosus, Linn. Sea coast. (*Rev. E. M. Forbes.*)
 PADINA pavonia, Lamour.—Sea coast. (*Rev. E. M. Forbes.*)
 ARTHROCLADIA villosa, Duby.—Mouth of the Cape Fear. (*Mrs.*
 Prioleau.)
 CHORDA tomentaria, Lyngb.—Coast.
 MESOGLOIA virescens, Carm.—Coast.
 ECTOCARPUS siliculosus, Lyngb.—Coast.
 viridis, Harv.—Coast.

RHODOSPERMEÆ.

- CHONDRIA dasyphylla, Ag.—Coast.
 POLYSIPHONIA variegata, Ag.—Coast.
 BOSTRYCHIA rivularis, Harv.—Coast.
 DASYA elegans, Ag.—Coast.
 CHAMPIA parvula, Harv.—Coast.
 ALSIDIUM Blodgettii, Harv.—Coast. (*Mr. Forbes.*)
 DELESSERIA Leprieurii, Mont.—Coast.
 NITOPHYLLUM punctatum, Grev.—Mouth of the Cape Fear. (*Mrs.*
 Prioleau.)
 GRACILARIA multipartita, J. Ag.—Mouth of the Cape Fear.
 GELIDIUM corneum, Lamourx.—Coast.
 SOLIERIA chordalis, J. Ag.—Coast.

- HYPNEA musciformis*, Lamourx.—Coast.
SCINAIA furcellata, Biv.—Coast.
CHONDRUS crispus, Lyngb. (Irish Moss.)—Ocean.
CHYLOCLADIA Baileyana, Harv.—Coast.
CERAMIVM rubrum, Ag.—Coast.
 diaphanum, Roth.—Coast.
SPYRIDIA filamentosa, Harv.—Coast.
GRIFFITHSIA corallina, Ag.?—Coast.
CALLITHAMNION Turneri, Ag.—Coast.
 polyspermum, Ag.—Coast.

CHLOROSPERMEAE.

- BRYOPSIS plumosa*, Lamourx.—Coast.
PORPHYRA vulgaris, Ag.—Coast.
ENTEROMORPHA intestinalis, Lk.—Mouth of the Cape Fear.
 compressa, Grev.—Mouth of the Cape Fear. (*Mrs.*
 Pringleau.)
ULVA latissima, Linn.—Coast.
 lactuca, Linn. (Green Laver.)—Coast.
BATRACHOSPERMUM moniliforme, Roth.—Common in fresh water
 streams.
TUOMEYA fluviatilis, Harv.—On stones in streams of Up. Dist.
LEMANEA torulosa, Ag.—On stones in streams of Up. Dist.
CHÆTOPHORA endiviæfolia, Ag.—Sea coast.
CLADOPHORA glaucescens, Griff.—Sea coast.
 refracta, Roth.—Sea coast.
SCYTONEMA minutum, Ag.—On limbs of trees and old shingles.
 myochrous, Ag.—On rocks.
 ossicola, Berk. & Curt.—On old bones in woods.
LYNGBYA majuscula, Harv.—Coast.
OSCILLATORIA ————?—In fresh pools of water.
NOSTOC commune, Ag.—Damp earth.
PALMELLA prodigiosa, Mont. On cooked vegetables.
PROTOCOCCUS viridis, Ag.—Bark of limbs.

SUMMARY.

FLOWERING PLANTS.

Exogenous,.....	1,362 species.	
Endogenous,.....	511	"
	<hr style="width: 10%;"/>	1,873

FLOWERLESS PLANTS.

Equisetaceae,.....	1	
Filices,.....	37	
Lycopodiaceae,.....	9	
Hydropterides,.....	1	
Musci,.....	198	
Hepaticae,.....	69	
Lichenes,.....	217	
	<hr style="width: 10%;"/>	532
Fungi—Hymenomycetes,....	935	
Gasteromycetes,....	150	
Coniomycetes,.....	341	
Hyphomycetes,.....	188	
Ascomycetes,.....	715	
Physomycetes,.....	21	
Doubtful Genera,....	42	
	<hr style="width: 10%;"/>	2,392
Characeae,.....	2	
Algae,.....	50	
	<hr style="width: 10%;"/>	52

Total species,.....	4,849
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OMISSA.

p. 81. *Agaricus* (Clitoe:) *ochropurpureus*, Berk.—Mid. In thin woods.

p. 93. *Lactarius angustissimus*, Lasch.—Common. Thin woods.

p. 93. *Russula nigricans*, Fr.—Mid. Earth in woods.

p. 152. *Uncinula intermedia*, B. & C.—Mid. On leaves of *Ulmus alata*.

ERRATA.

p. 10, line 8th, for "Com. Poppy," read Corn Poppy.

p. 20, line 14th, for "Mid. Dist.," read Mountains.

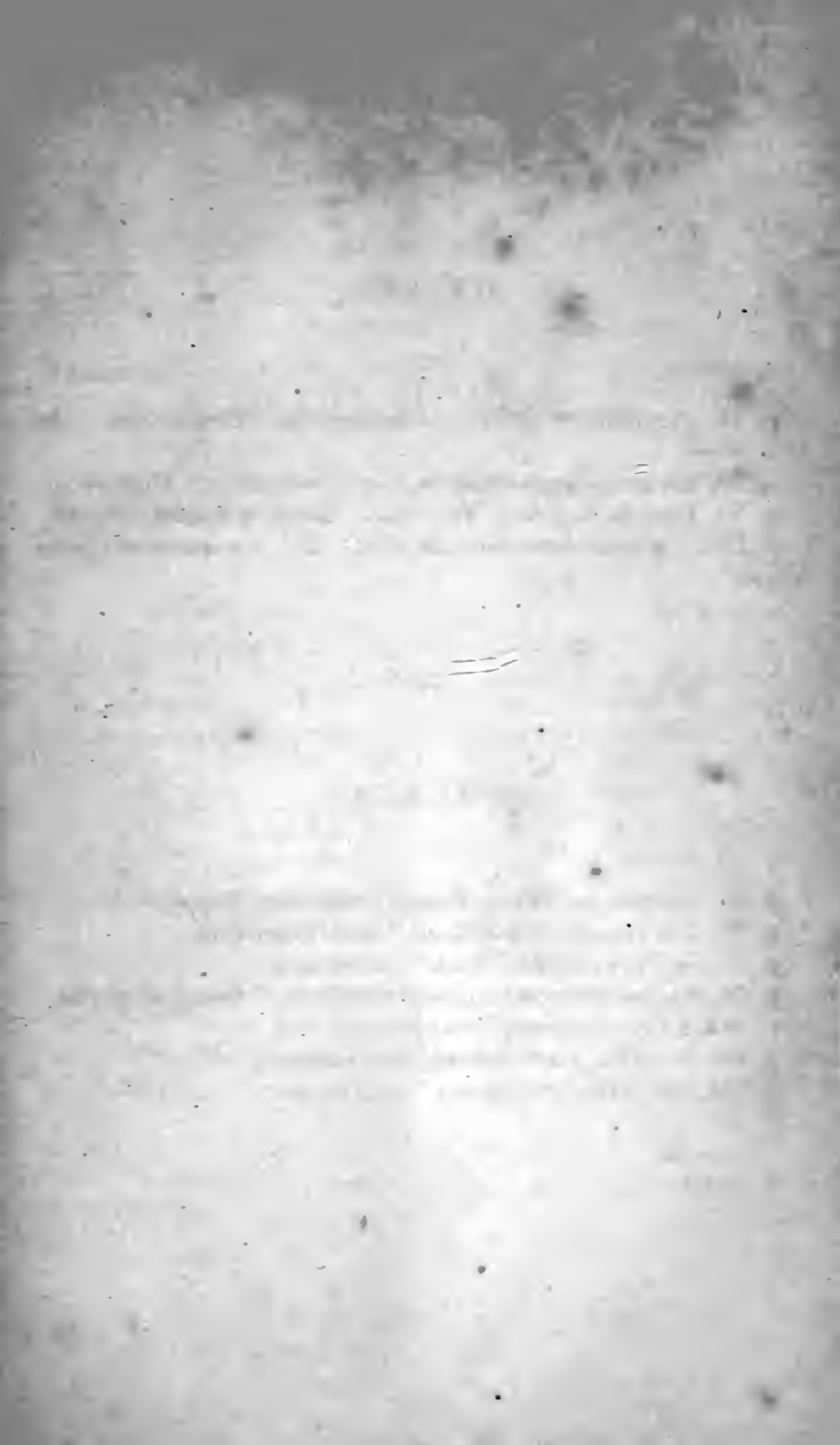
p. 72, for *PETRAPLODON*," read *TETRAPLODON*.

p. 76, 6th line from bottom, for "playthylla," read platyphylla.

p. 115, for *SPAERONEMA*," read *SPHERONEMA*.

p. 134, line 11th, for "cronata," read coronata.

p. 134, line 14th, for "coroceae," read crocea.





May Bagley 3

REPORT

OF

THE PROGRESS

OF THE

GEOLOGICAL SURVEY

OF

NORTH-CAROLINA 1866,

By PROFESSOR W. C. KERR.

RALEIGH;

**WM. E. PELL, STATE PRINTER,
1867.**

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EXECUTIVE DEPARTMENT N. C.

RALEIGH, *January 31, 1867.*

To the Honorable,

The General Assembly of North Carolina :

GENTLEMEN :—I have the honor to transmit, herewith, the report of the State Geologist, and commend it to your careful consideration.

JONATHAN WORTH.

10. The Commission has also been informed that the Government of India has been requested to provide information on the progress of the implementation of the recommendations of the Commission's report on the subject.

2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100, 2101, 2102, 2103, 2104, 2105, 2106, 2107, 2108, 2109, 2110, 2111, 2112, 2113, 2114, 2115, 2116, 2117, 2118, 2119, 2120, 2121, 2122, 2123, 2124, 2125, 2126, 2127, 2128, 2129, 2130, 2131, 2132, 2133, 2134, 2135, 2136, 2137, 2138, 2139, 2140, 2141, 2142, 2143, 2144, 2145, 2146, 2147, 2148, 2149, 2150, 2151, 2152, 2153, 2154, 2155, 2156, 2157, 2158, 2159, 2160, 2161, 2162, 2163, 2164, 2165, 2166, 2167, 2168, 2169, 2170, 2171, 2172, 2173, 2174, 2175, 2176, 2177, 2178, 2179, 2180, 2181, 2182, 2183, 2184, 2185, 2186, 2187, 2188, 2189, 2190, 2191, 2192, 2193, 2194, 2195, 2196, 2197, 2198, 2199, 2200, 2201, 2202, 2203, 2204, 2205, 2206, 2207, 2208, 2209, 2210, 2211, 2212, 2213, 2214, 2215, 2216, 2217, 2218, 2219, 2220, 2221, 2222, 2223, 2224, 2225, 2226, 2227, 2228, 2229, 2230, 2231, 2232, 2233, 2234, 2235, 2236, 2237, 2238, 2239, 2240, 2241, 2242, 2243, 2244, 2245, 2246, 2247, 2248, 2249, 2250, 2251, 2252, 2253, 2254, 2255, 2256, 2257, 2258, 2259, 2260, 2261, 2262, 2263, 2264, 2265, 2266, 2267, 2268, 2269, 2270, 2271, 2272, 2273, 2274, 2275, 2276, 2277, 2278, 2279, 2280, 2281, 2282, 2283, 2284, 2285, 2286, 2287, 2288, 2289, 2290, 2291, 2292, 2293, 2294, 2295, 2296, 2297, 2298, 2299, 2300, 2301, 2302, 2303, 2304, 2305, 2306, 2307, 2308, 2309, 2310, 2311, 2312, 2313, 2314, 2315, 2316, 2317, 2318, 2319, 2320, 2321, 2322, 2323, 2324, 2325, 2326, 2327, 2328, 2329, 2330, 2331, 2332, 2333, 2334, 2335, 2336, 2337, 2338, 2339, 2340, 2341, 2342, 2343, 2344, 2345, 2346, 2347, 2348, 2349, 2350, 2351, 2352, 2353, 2354, 2355, 2356, 2357, 2358, 2359, 2360, 2361, 2362, 2363, 2364, 2365, 2366, 2367, 2368, 2369, 2370, 2371, 2372, 2373, 2374, 2375, 2376, 2377, 2378, 2379, 2380, 2381, 2382, 2383, 2384, 2385, 2386, 2387, 2388, 2389, 2390, 2391, 2392, 2393, 2394, 2395, 2396, 2397, 2398, 2399, 2400, 2401, 2402, 2403, 2404, 2405, 2406, 2407, 2408, 2409, 2410, 2411, 2412, 2413, 2414, 2415, 2416, 2417, 2418, 2419, 2420, 2421, 2422, 2423, 2424, 2425, 2426, 2427, 2428, 2429, 2430, 2431, 2432, 2433, 2434, 2435, 2436, 2437, 2438, 2439, 2440, 2441, 2442, 2443, 2444, 2445, 2446, 2447, 2448, 2449, 2450, 2451, 2452, 2453, 2454, 2455, 2456, 2457, 2458, 2459, 2460, 2461, 2462, 2463, 2464, 2465, 2466, 2467, 2468, 2469, 2470, 2471, 2472, 2473, 2474, 2475, 2476, 2477, 2478, 2479, 2480, 2481, 2482, 2483, 2484, 2485, 2486, 2487, 2488, 2489, 2490, 2491, 2492, 2493, 2494, 2495, 2496, 2497, 2498, 2499, 2500, 2501, 2502, 2503, 2504, 2505, 2506, 2507, 2508, 2509, 2510, 2511, 2512, 2513, 2514, 2515, 2516, 2517, 2518, 2519, 2520, 2521, 2522, 2523, 2524, 2525, 2526, 2527, 2528, 2529, 2530, 2531, 2532, 2533, 2534, 2535, 2536, 2537, 2538, 2539, 2540, 2541, 2542, 2543, 2544, 2545, 2546, 2547, 2548, 2549, 2550, 2551, 2552, 2553, 2554, 2555, 2556, 2557, 2558, 2559, 2560, 2561, 2562, 2563, 2564, 2565, 2566, 2567, 2568, 2569, 2570, 2571, 2572, 2573, 2574, 2575, 2576, 2577, 2578, 2579, 2580, 2581, 2582, 2583, 2584, 2585, 2586, 2587, 2588, 2589, 2590, 2591, 2592, 2593, 2594, 2595, 2596, 2597, 2598, 2599, 2600, 2601, 2602, 2603, 2604, 2605, 2606, 2607, 2608, 2609, 2610, 2611, 2612, 2613, 2614, 2615, 2616, 2617, 2618, 2619, 2620, 2621, 2622, 2623, 2624, 2625, 2626, 2627, 2628, 2629, 2630, 2631, 2632, 2633, 2634, 2635, 2636, 2637, 2638, 2639, 2640, 2641, 2642, 2643, 2644, 2645, 2646, 2647, 2648, 2649, 2650, 2651, 2652, 2653, 2654, 2655, 2656, 2657, 2658, 2659, 2660, 2661, 2662, 2663, 2664, 2665, 2666, 2667, 2668, 2669, 2670, 2671, 2672, 2673, 2674, 2675, 2676, 2677, 2678, 2679, 2680, 2681, 26

1. The first step is to identify the problem or question that needs to be answered. This involves understanding the context and the specific requirements of the task.

1. The first part of the document is a letter from the President of the United States to the Congress, dated January 3, 1862. It is a very long letter, and it contains a great deal of information about the state of the country at that time. It is a very important document, and it is one of the most interesting documents in the collection.

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1. The first step is to identify the problem or question that needs to be answered. This involves understanding the context and the specific requirements of the task.

1. The first step is to identify the problem. This involves understanding the current situation and what needs to be changed.

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1. The first step is to identify the problem or question that needs to be answered. This involves understanding the context and the specific requirements of the task.

REPORT OF THE PROGRESS
OF THE
GEOLOGICAL SURVEY OF NORTH CAROLINA.

To his Excellency, JONATHAN WORTH,
Governor of North Carolina:

SIR:—I have the honor to submit the following report of the progress of the geological survey of this State, since I have had charge of the work. I have prefixed a brief history of the survey itself, from its first inception, thinking it might be of some interest to yourself as well as the public.

My commission bears date April 4th, 1866. After completing the investigation of the subject of the Swamp Lands and the report thereon, which was undertaken at the request of your Excellency and the Literary Board, and, at the same time, acquainting myself with the history and condition of the geological survey, and having ascertained that there were no apparatus or instruments, either for field or laboratory work, belonging to the survey, my predecessor having made use of his own and other laboratories north, I found it necessary, first of all, to provide an outfit, preparatory to taking the field. This brought me to the middle of summer. My work in connection with the actual survey, therefore, dates from this point.

An examination of the reports and official correspondence of my predecessor, having shown that the western portion of the State, beyond the Catawba River, was yet unsurveyed, your Excellency concurred with me in the opinion, that my attention should first be directed to that region. I accord-

ingly crossed the Blue Ridge, and addressed myself to the task of making a rapid sketch of the transmontane section, hoping to complete the tour of those eleven counties within the remaining operative months of the year.

The weather having proved so auspicious as to permit outdoor operations until the beginning of December, I was able to carry out my plan beyond my own expectations, having travelled, mainly in the saddle, 1700 miles of mountain roads and mountains without roads, in less than four months. A summary of some of the more important observations is herewith respectfully submitted, with the hope that your Excellency will find something of the same satisfaction, with myself, in the discovery of the great and almost unknown resources, both agricultural and mineral, of the mountainous portion of our State. And it must be remembered that the region beyond the Blue Ridge, to which my explorations were limited, constitute only about one-half of the hitherto unexplored division of the State. The remainder, extending from the Blue Ridge and Yellow mountains, to the Catawba River and Pilot mountain, which will next claim attention, will, I am satisfied, from many general indications, prove equally interesting.

Your most obedient servant,

W. C. KERR,
State Geologist.

PREFACE.

Before resuming the Geological Survey of the State, it was, of course, necessary for me to ascertain precisely the progress which had been made, and the point which had been reached by my predecessor; *i. e.* it was necessary to know what had been done in order to know what remained to be done. This investigation brought to my knowledge many facts in the history of the Survey, which seem to me to have an interest for others besides myself. A few of these will therefore be given in brief.

The first suggestion of a geological survey of the State, so far as appears from the records, was made by Prof. Olmsted, of the University, in 1821, in a letter to the Board of Public Improvements. Judge Murphy, however, on the part of the same Board, had, in their report for 1819, observed that, in executing the surveys which they were required by the Assembly to have made, in prosecuting their various schemes of internal improvement, they had "attempted to render the surveys subservient to the interests of science by collecting information of its geology and mineralogy," but had entirely failed. The letter of Prof. Olmsted was referred by the Board to the Legislature, but no action was taken. About this time, however, a new interest was given to the subject, by the discovery of the remarkable gold deposits of Cabarrus and the neighboring counties, which yielded the largest "nuggets" which had then been seen. When, therefore, the suggestion of Prof. Olmsted was renewed a year or two later, with the proposition to spend his vacations in geological excursions, and "asking merely such an appropriation as would defray the expenses of the undertaking," the result was the passage of an Act of Assembly in 1823, authorizing the Board of Agriculture to have such survey made, and appropriating for the purpose \$250, for four successive years; which was afterwards continued for two years longer. The

survey thus ordered was partly executed by Prof. Olmsted, and after his removal to Yale College, was continued by Dr. Mitchell. Their observations were published from time to time until 1827, occupying, in the aggregate, about 125 octavo pages. They were necessarily confined to the eastern and middle sections of the State.

Geology was then in its infancy, and in the light of the science of the present day, and in comparison with the huge folios of modern surveys, with their splendid illustrations, those thin and unpretending pamphlets look meagre and valueless, except, perhaps, to the antiquary. But they served an important purpose in their time, and contain, besides, a mass of information which is still valuable. Here the work rested until resumed under the present law on the subject.

Meanwhile the science of geology had grown from the smallest beginnings to an importance and breadth, wholly unimagined in 1825, and its practical bearings upon all the economies and industries of men, especially upon mining and agriculture, in discovering and developing the hidden resources of the earth, had become recognized and appreciated every where. The other States, as well as foreign nations, had, most of them, ordered and executed, many of them at an immense cost, complete surveys of their territory. The importance attached to such surveys elsewhere may be illustrated by a single example. The following is the law of California, whose survey is one of the most recently undertaken and is still in progress.

“AN ACT TO CREATE THE OFFICE OF STATE GEOLOGIST, AND TO DEFINE THE DUTIES THEREOF.

The people of the State of California, represented in Senate and Assembly, do enact as follows :

SECTION 1. J. D. Whitney is hereby appointed State Geologist. He shall be commissioned by the Governor, and it shall be his duty, with the aid of such assistants as he may appoint, to complete the geological survey of the State, and prepare a report of such survey for publication, and superintend the publication of the same. Such report shall be in

the form of a geological, botanical, and zoological history of the State, and the number of copies of each volume to be printed, and the style, form, maps, diagrams, or illustrations to be contained therein, or to be published separately, shall be determined by the State Geologist; and said report, when published, shall be sold upon such terms as the Governor and Secretary of State shall decide upon, and the proceeds of such sales shall be paid into the Common School Fund of the State.

SEC. 2. It is hereby made the duty of the State Geologist, and his Assistants, to devote the time not necessarily required, in the preparation and superintendence for publication of the reports provided for in section one, of this act, to a thorough and scientific examination of the gold, silver and copper producing districts of this State, and to make such scientific and practical experiments as will be of value in the discovery of mines and the working and reduction of ores.

SEC. 3. The following sums of money are hereby appropriated, out of any money in the State Treasury not otherwise appropriated, for the prosecution of the Geologist Survey of the State, and for the sixteenth and seventeenth fiscal years: For salary of the State Geologist, nine thousand dollars, to be drawn monthly, on the last day of each month; for the salary of two Assistants, six thousand six hundred dollars, to be drawn in the same manner as the salary of the State Geologist; for publication of two volumes of reports, six thousand dollars; for office rent, and expenses of survey in mining districts, and experiments on ores, and all incidental expenses of work, ten thousand dollars, to be drawn one-half each fiscal year.

SEC. 4. This act shall take effect immediately.

Approved, April 4, 1864.

F. F. LOW, Governor."

The State of North Carolina had long been pointed out by scientific travellers, as well as by the labors of Prof. Olmsted and Dr. Mitchell, and by accidental discoveries, as the repository of great and varied mineral wealth; and the necessity of an adequate and complete survey was widely felt and its

authorization was frequently and earnestly advocated by the leading men of the State, and often formed the subject of Executive messages and of legitimate discussions. I quote from three annual messages.

"A Typographical, Geological and Mineralogical Survey of the State is highly desirable. The minerals and ores are believed to be incalculably valuable; and the limestone and marble which might thus be brought to light, would benefit the farming interest beyond the cost of the undertaking." (Gov. Dudley, 1838.)

"I believe the same amount of money could not be so usefully applied in any other way, as in procuring these surveys." (Gov. Morehead, 1844.)

"I trust no consideration will induce a longer delay in directing an Agricultural, Geological and Mineralogical Survey of the State. Three-fourths of our sister States have now in progress, or have finished like examinations of their territories. And in every instance, it is believed, that they have not only added to the treasures of science, but have been attended with important and useful discoveries. Many valuable minerals are already known to exist in various sections of the State; and a further exploration cannot fail to bring to light other resources, and greatly favor the pursuits of Mining and Manufacturing; while a minute examination of our soils by persons uniting science and practical skill in agriculture, will be productive of improvement in that useful branch of industry." (Gov. Graham, 1846.)

At the session of 1851-'2, the existing law on the subject was enacted; which is found on page 69, chap. 2, of the Rev. Code. As this constitutes the authority under which the present Survey proceeds, and is familiar to very few, it is inserted here.

"SECTION 13. The Governor shall appoint a suitable person to conduct, under the supervision of himself and the Literary Board, a Geological, Mineralogical, Botanical and Agricultural Survey of the State.

14. The person appointed shall examine and survey each and every county of the State, and ascertain the different geological formation of each county and section of the State; the nature, character and value of its minerals; the nature and character of its soils, and the best mode of improving the same; the nature and kind of its productions, and their relative position and value; its facilities for manufactories; the extent and value of its water-power; the character and value of its botanical productions; the character and value of its timber, and all other facts connected with the subjects of Geology, Mineralogy, Botany and Agriculture, which may tend to a full development of the resources of the State; and such person is authorized to employ as many proper agents and assistants, to be approved by the Governor, as may be necessary to enable him speedily and successfully to accomplish the objects committed to his charge; and he shall, from time to time, communicate to the Governor, to be by him communicated to the Legislature, a report, or reports in writing, setting forth fully the results of his Survey; which reports shall be published under the supervision of the Governor and Board of Literature.

15. The expenditures incurred by said Survey shall not exceed five thousand dollars per annum, to be paid by the Public Treasurer, upon the warrant of the Governor, out of any monies in the Treasury, not otherwise appropriated.

16. The person making such survey, shall deliver lectures upon the subjects committed to his charge, in the villages through which he may pass: Provided, that he shall not thereby delay his other duties."

Dr. E. Emmons received the appointment of State Geologist under this act, in 1852, and retained the office until his death, in 1863. His son, Dr. E. Emmons, Junior, was nominated assistant Geologist. Dr. E. has given the results of his labors in five reports.

The first, issued in the latter part of 1852, relates to the Agriculture of the lower counties, and the coal of Rockingham and Chatham.

The second report, in 1856, is the largest of the series, and relates chiefly to the Geology, and particularly to the mines of

the "midland counties," and has some additional matter on the coalfields.

The report for 1858, is a general treatise on Agriculture. Two short reports appeared in 1860; one, a continuation of the report on Agriculture, the other on the Swamp Lands.

During this last year was also issued a report by Dr. Curtis, on the "Woody Plants of North Carolina," prepared at the request of Dr. Emmons. His Catalogue of the plants of the State was presented for publication at the same time, but for some unexplained reason, failed to get through the press. This catalogue, together with two other reports by the same distinguished gentleman, one on the "Mammals," the other on the "Reptiles of North Carolina," still await publication, having been prepared in connection with the survey.

It appears also, from a letter, or brief report of Dr. E. to Governor Ellis, in 1860, that there was still a considerable amount of material on hand for publication; including many analyses of soils and minerals, with additional discoveries in the coal region; also a report by Mr. C. D. Smith, of Macon county, on a portion of the mountain section of the State, with some observations by himself in the same section; and he has also alluded, several times, in his published reports, to a Geological Map of the State, as in course of preparation by the draughtsman of the survey, Dr. E. Emmons, Jr.

No work seems to have been done in connection with the survey after 1860, Dr. Emmons' attention having been turned to the manufacture of warlike munitions. And there is no report of any geological operations subsequent to that of 1856.

Having been myself appointed State Geologist in 1864, and having held the office during the last year of the war, *nominally, and without pay, and with special instructions* to look after certain chemical and mineral manufactures, in which the people of the State were vitally interested, and becoming acquainted with the above stated facts in reference to the condition of the Survey, it appeared to be my duty to collect such papers and documents connected with the work, as might be of value to the State, especially to secure the map which was a most important desideratum, and might be ex-

pected to constitute a most valuable summary of the complete results of the survey. Supposing these papers to be in the custody of the surviving family of Dr. E., and especially of his assistant, I accordingly made application for them under the executive sanction and authority. And the application has been several times renewed, since the close of the war, and with the approval of his Excellency, the present Governor, but so far without success.

The geological survey, then, has been in progress about nine years, from 1852 to 1860. The reports published relate to the Geology and Agriculture of the eastern section of the State, including the Swamp Lands, and to the geology and mines of the "midland counties," as far west as the Catawba River. The portion of the State beyond this to the Tennessee line is, so far as appears from the reports, wholly unexplored.

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CHAPTER I.

INTRODUCTORY.

In undertaking a Geological Survey, two things require to be definitely settled,—*the object* and *the method*. Some observations on each of these points will probably not be deemed out of place here :

THE OBJECT

Or design of the Geological Survey of North Carolina, is to be gathered chiefly from the law establishing it. From this it appears that a General Geological Survey is contemplated. Such general survey has necessarily a two-fold purpose and aspect, scientific and practical. The first is in order to the second, as a means to an end. But it is also an end in itself, in the same sense and degree, and for the same reason that all true science is so. And then we have long enough seen, on the geological maps of the continent and of the world, that appear from time to time, the space of North Carolina occupied by broad analogical conjectures, or left wholly blank, like the centre of Africa, or the Antarctic continent. The scientific, however, owes its chief value to its relation to the practical in the legislative intention. For it is only by means of a systematic and thoroughly scientific investigation of the geological structure and characteristics of a region, that results of any value in themselves can be reached, or that will carry with them any credit or authority abroad. It is only when geological observations and deductions are thus characterized, that they can be brought into comparison with similar results in other parts of the world, and foreigners be enabled to assure themselves of the probability and value of alleged discoveries.

The immediate practical bearings of the survey are prominently considered as looking in two principal directions, the developement of the mineral wealth that may be concealed

beneath the surface, and the promotion of agriculture. It would certainly be difficult to over-estimate the importance of any agency which may reasonably be expected to advance these two leading interests of mankind. It is little that we do not owe directly or indirectly to the soil, or the mine.—Almost no art or industry is independent of these two great sources of individual and national prosperity. Where are we to look here in North Carolina, in our depression and calamity, for the recuperation of our lost fortunes and the restoration of our prostrate business, if not to the improvement of our soil and methods of tillage, and to the mineral riches hidden away in their subterranean storehouses? In establishing the Geological Survey with a view to the promotion of these so important interests, the Assembly of North Carolina have but adopted the experience and endorsed the judgment of the most practical and enlightened and prosperous states of Europe and America. It is impossible to estimate what the Geological Surveys of England, of France, of Pennsylvania, have done for their mines of coal, salt, iron, or to realize their effect upon the prosperity of those States.

The connection of Geology with mineralogy and mining is immediate and obvious, so much so that it is popularly regarded as simply the science of ore-hunting. It serves, in the first place, to direct and to limit the operations of the miner, and tells him where his labor may be profitably expended. By determining the age and relations of the rocks of a region, it indicates the limits within which certain minerals may be found; and traces the connections and outlines, the direction and position, the *strike* and *dip* of beds and veins of minerals, and thus points out the proper plan of mining operations to be adopted in each case. Hence the intelligent capitalist hesitates to invest in mineral property without consulting competent geological authority; and the intelligent immigrant, to venture into a new country, without first consulting its geological reports. It is this which has lately given so high a market value, even to the partial and incomplete reports of this and some other of the southern States, and created so great a demand for them north and in Europe, that scarcely a copy can now be found. The nega-

tive effects and value of geological surveys are scarcely less important than the positive. The miner is not only directed where he may bestow his labor profitably, but is likewise deterred from operating in other directions, where his labor would be fruitless and ruinous. Millions have been squandered even in our own country in the useless and foolish search after minerals which never existed. "In the upper valley of the Delaware and Schuylkill, and in many other places, men have spent years, long lives in fact, and fortunes, in digging vainly into the black slate for coal." (Lesley.) And the question is often asked here, whether coal may not be found, and search has often been made for it, in certain localities in the western portion of our State, where its presence would give immense importance and value to the vast accumulations of iron ore, which characterize many of those counties. Geology at once pronounces the search futile. And so, just now, the question is frequently asked, whether petroleum may not be found in different parts of the State; and large tracts of our mountain lands have been lately bonded by parties prospecting for oil. The geologist has no difficulty in pronouncing all such projects utterly hopeless, as to the whole of that region, and in indicating these very limited tracts within our borders, where alone such operations have any possibility of success. And so of iron works which have often been projected on an extensive scale, upon the mistaken supposition of the presence of the proper quantity and quality of ore. I have frequent occasion to forestall and prevent useless expenditures and hopeless enterprises of this sort. And the least geological information, the rudest geological survey of our western counties, would have prevented the enormous waste of time, energy and money that have been expended by hundreds of men, for many years, in the ridiculous pursuit of a mineralogical phantom, in the search after repetitions and continuations of *Ducktown*.

But the relations of the survey to agriculture, which must ever remain the chief employment and resource of our people, are equally real and important, although not equally obvious. The Act of Assembly under which the survey proceeds, requires that special attention be given to this subject, and

specifies the analysis of soils, and directs attention to whatever may contribute to the promotion of this interest. Soil is derived from and owes its composition and character to the subjacent rock. Every one has observed, in travelling from east to west in this State, the frequent and complete transition from one color and physical character of soil to another. And it can hardly have escaped even the casual observer that such change is always coincident with a change in the underlying rocks, indicating unmistakably a genetic relation. Thus granite gives rise, by its disintegration, to a certain description of soil, whose essential ingredients are precisely limited and determined by the composition of that rock; and so of clayslate, sandstone, trap, &c. Of course alluvial and drift soils are exceptional, their material having been transported and sorted after disintegration. So that Geology, calling in the aid of Chemistry, points out the origin, composition and differences of soils, and suggests the mode of their preservation, restoration and improvement, and indicates also the source whence their deficiencies may be supplied.

But the tiller of the soil has yet other difficulties to contend with and other doubts to be resolved. The same soil in different latitudes and at different elevations, above, and distances from the sea, will not yield the same crops. Moisture, limits of temperature and its annual average and total amount, and all those complex and varied climatic conditions which affect and control the growth, and determine the range of plants, as the grasses, grains and fruits, which again limit and determine the employments and pursuits of populations,—all these demand investigation, and are properly committed to the survey. The Act of Assembly also directs observations to be made on the Botany and Zoology of the State, both because these are necessary to the completeness of the survey, and are demanded by science, and (chiefly) because, without them, no description of the capabilities, resources and natural adaptations of a country can be accounted full and satisfactory; and hence these things are always prominently set down by travellers and explorers of new countries.

Lastly, a *collection* is required to be made, which shall ex-

hibit, in a general view, the soils, minerals, botany and zoology, which shall, in fact constitute an epitome of the geological and natural history, the agricultural and mineral characteristics and resources of the whole State. So much in brief for the objects proposed to be accomplished by the Geological Survey.

THE PLAN OF OPERATIONS.

Since the general geological survey must necessarily serve as the basis and ground-work of the whole, this comes first in order. It was necessary, therefore, in the beginning, to take a bird's-eye view of the whole field of operations,—to make a geological reconnoissance, in order to catch the outlines and leading features of the geological structure of the region to be studied, and thus to construct a skeleton, or framework in which all the future details of the work would easily and intelligibly arrange themselves, as they should be developed. This was necessary also, in order to ascertain the character and amount of the work to be done, and to what points special effort and attention should be directed. This could be accomplished most speedily and satisfactorily, by making a series of transverse sections across the upturned edges of the strata. In this State, the direction of these edges, the *strike*, is almost universally from N. E. to S. W. And this direction, being also that of the dominant mountain chain, the rivers, in seeking the line of quickest descent, necessarily take a direction at right angles to the strike; and having worn for themselves deep channels through the strata, furnish extensive exposures of the rocks, and so give the readiest means of obtaining the desired sections; although one is often obliged to use, for this purpose, the artificial and accidental exposures along the tracks of railroads, turnpikes and even common roads.

The Ocoee, Hiwassee, Cheowah, Nantehaleh, Tennessee, Tuckasege, Pigeon and French Broad, with the Oconaluftee, and Toxaway, furnished me as many sections, some of them partial, some of them completely across the breadth of the State. These sections enabled me to locate, beyond the possibility of a doubt, all the prominent geological features of

the region, and furnish data also for the construction of a geological map of that hitherto unknown country. I was thus able also to set at rest the great question, so much discussed among the numerous indigenous and exotic geologists, miners and speculators of that section, as to the course and position in North Carolina of the "Ducktown Lead." It is universally believed and taken for granted that the rocks which contain those remarkable accumulations of copper ores on the Ocoee at Ducktown, pass eastward, through the whole mountain section of this State, and contain all the copper of Macon and Jackson, to Ashe county. This opinion is shared by the most intelligent citizens. The above sections, however, demonstrate that the copper slates of the Ocoee are not found this side of the Smoky Mountains, and that the copper "veins" of Jackson, &c., belong to an entirely different geological age and formation, being in fact far more ancient and *possibly* having furnished the material for those later segregations of Ducktown.

PALEONTOLOGY.

In this department much remains to be done. Neither the Tertiary fossils of the eastern counties, nor the Mesozoic of the Deep River and Dan River Coal beds, nor yet the supposed Azoic (so-called Taconic) organisms of the middle section have been fully and satisfactorily studied and illustrated. I am gratified to announce, however, that so much interest is felt by scientific men in these subjects that several of the most eminent paleontologists of the country have proffered their services gratuitously to work up whatever material of this sort the progress of the survey may bring to light. This fact is the more worthy of mention, because this is usually the most tedious and expensive part of the whole work.

GEOGRAPHY, PHYSICAL GEOGRAPHY AND TOPOGRAPHY.

In the prosecution of the Survey, one of the first difficulties encountered arose from the want of an accurate geographical

map, on which to locate my geological observations. There is no map of this region in circulation ; worthy of the name, those which we have being nothing but the rudest conjectures. I had hoped to find, in the archives of the capitol, sufficient material for the construction of a skeleton map, on which to lay down my observations. During the period from 1821 to 1843, while the Board of Internal Improvement had in its employ a State Engineer, surveys were made of all our rivers on this side of the Blue Ridge, and of many small creeks also, from the seacoast to the base of the mountains ; and during that period and up to the present time, numerous surveys have been made (mostly at the public expense) of routes for rail roads, turnpikes, canals and common roads, making an aggregate of several thousand miles. The field-notes, plans and drawings of these, if they had been preserved, would furnish a net-work of lines covering the whole State, and would leave little to be done in order to construct an accurate geographical and even an approximate topographical chart. But not half a dozen of these surveys have left any available trace of their existence among the records. The difficulty, however, was partly overcome by means of a hand-copy of a map (kindly furnished me by the author, for this purpose) of the mountain section of the State. This map is in course of preparation for publication by Prof. A. Guyot, of Princeton, the first of living geographers, who has done more for the elucidation of the geography and topography of our mountains than all other observers together. Having provided myself with barometers and sextant for the purpose, I have made many additional observations for the determination of altitudes and the triangulation of those sections omitted by Prof. Guyot. I have the satisfaction also of announcing that this gentleman has promised me his co-operation for three or four weeks, in the spring, in order to complete this important work, of which he will shortly give us the entire results.

Inasmuch as the absolute geographical position of no point west of the Blue Ridge (and so far as I know, west of the University,) had been determined by astronomical observations, having provided, in my outfit, a chronometer and marine sextant, I made, in passing through the several county

towns, a series of double-altitude observations, for the purpose of fixing the latitude and longitude of those points, which will give a degree of accuracy otherwise unattainable, to all the geodetic observations which have been, or may hereafter be made, in that section, and will render them available as a basis for the geological survey and map.

In making the barometrical observations, Mr. Charles Curtis, of Hillsboro', volunteer assistant, rendered me essential service as corresponding observer.

CLIMATOLOGY.

The survey is also indebted to volunteer assistance in this department. I have established, through such aid, a series of meteorological observations in each of the counties visited, the observers being furnished with instruments of simple construction for the purpose. These observations will continue as long as the survey lasts, and will furnish the means of ascertaining the annual fall of rain, its distribution through the seasons, the temperature, and the other elements of climate of the several mountain plateaus. I propose to extend this system of observations over the whole of our mountain counties, the climate and products of which vary much, even within short distances.

CHEMISTRY.

As I found no laboratory attached to the survey, and as the annual appropriation is entirely inadequate to purchase the necessary apparatus, I have availed myself of the courtesy of the President and Chemical Professor of the University, who have offered the use of the College laboratory. I have also made arrangements with an eminent chemist at Charleston, S. C., Prof. N. A. Pratt, who will make such analysis of soils and minerals, as may be required by the Survey from time to time.

BOTANY.

This department has been so thoroughly worked up by Dr. Curtis, and other scientific explorers that almost nothing remains to be added.

ZOOLOGY.

Here also little will be required of the survey, since the elaborate and extensive works on the general subject of American Zoology, published under the auspices of the Smithsonian Institution, and the monographs of Dr. Curtis already referred to, have covered almost the entire ground. Whatever new material may come to light, however, during the course of the survey, will be placed in the hands of Dr. C. and those other distinguished naturalists to whose department the specimens may belong, who, in their devotion to science, have offered their aid for this purpose gratuitously.

CABINET.

Of the collection of minerals and fossils which had been placed in the Geological room of the Capitol by Dr. Emmons, the very small remnant, which escaped the ravages of the soldiers which occupied the city after the close of the war, was removed, under an act of Assembly, to the University. A cabinet is justly considered as among the most important and valuable results of a geological survey. A judiciously selected and properly arranged collection would exhibit, in one view, the whole geology of the State, and should furnish palpably the "testimony of the rocks" themselves to the truth of the observations and deductions of the written reports. Such a collection would reveal to the man of science the general geological structure of the State, and even many of the details of the lithology, position and succession of the formations, as well as their fossil contents; and should also represent its botanical and zoological productions. But, in addition to this, it should convey instruction of a practical character to the intelligent miner and farmer. To the latter, by a judicious selection and arrangement of the principal different

kinds of rocks, with their derivative soils, and, with analyses of each, it would furnish the means of identifying his own particular soil, of referring it to its proper class, and, so of discovering its character and defects, and the proper remedies: while the former, by a proper collection of ores and their associate minerals, their gangues, wallings and enveloping rocks, would be enabled to form a correct judgment of the value and character of the different mineral veins and districts of the State, without the labor and expense of visiting them.

MAPS.

These are valuable, and indeed essential, for the same reasons. viz., that they serve to condense and reveal, in a single, intelligible and connected view, the aggregate results of the whole survey, showing, at a glance, the kinds of rocks which occupy the entire surface, in their due position, order and succession and relative extent.

All these different departments of the work go on simultaneously, without interfering with each other; so that the whole series of observations are completed for a given district in a single tour.

I have been thus explicit in the exposition of the plan of procedure, which appeared to me to be best adapted to accomplish most successfully, the design of the survey, because I believed that so much would be both intelligible and interesting to a large class of our people, and because such a course seemed likely to increase the public interest in the work, which, it is every way desirable and important to do, and because I have no sympathy with that spirit in which science is sometimes seen to envelop itself with an air of oracular reticence and remoteness, and to write over the doors of its chambers, the mandate of exclusion and mystery, *Procul, O! procul este, profani*.

CHAPTER II.

OUTLINE OF THE GEOLOGY OF WESTERN NORTH CAROLINA.

I wish this to be considered as a *report of progress*, and not as a final or complete *geological report* of the section to which it relates; the work done being, as already explained, only a reconnoissance preparatory to a detailed survey. The entire results of even this preliminary examination can not be given in this brief sketch. This could only be done after making all the computations for the Barometrical and Astronomical observations, and constructing maps and sections from numerous field notes, and making analyses of a large number of the specimens collected.

The territory explored, comprising the eleven counties west of the Blue Ridge and Yellow Mts., and extending from Mitchell to Cherokee, contains an area of some 4000 square miles. The following brief description of the physical features of the region by Prof. Guyot, is of sufficient interest in this connection to justify its insertion here. It is taken from an elaborate paper "On the Apalachian System," published in the American Journal of Science, in 1861:

"The vast belt of the Appalachian highlands forms the marginal barrier of the American continent on the Atlantic side, and determines the general direction of the coast line, which, in general, runs parallel to the inflections of its chains with remarkable regularity. This system, composed of a series of corrugations tolerably uniform, does not, like the Alps, or other great systems of fracture, have a central or main axis, to which the secondary chains are subordinated. But it is properly compared, to the system Jura, for it is composed like that of a series of long folds, or chains, which run parallel to each other, often with great regularity. In the same part of the system the general height of the chains is sensibly equal and their summits show neither many nor deep notches. In the middle regions, especially in Pennsylvania and New Jersey, they present the appearance of long and continuous walls, the blue summits of which trace along the horizon a uniform line seldom varied by any peaks or

crags. In the extreme northern and southern portions, however, this character is considerably modified. There the system loses very much of its uniformity and its physical structure becomes far more complicated; the form of simple parallel ridges almost entirely disappears.

There is one feature of the Appalachian system which distinguishes it from the ranges of the Jura; it is the well marked division into two longitudinal zones of elevation, one turned towards the shores of the Atlantic, in which the form of parallel chains just spoken of predominates, and the other turned towards the interior, which is composed of elevated and continuous plateaus, descending from the summit of their eastern escarpment, in the centre of the system, in gentle stages towards the basins of the lakes and the valley of the Ohio. Another feature, not less conspicuous, characterizes the region of corrugations properly so-called. This is a large central valley which passes through the entire system from north to south, forming, as it were, a negative axis through its entire length. This is what Mr. Rogers calls the great Appalachian valley. At the north it is occupied by lake Champlain and the Hudson river; in Pennsylvania it bears the name of Kittatiny or Cumberland valley. In Virginia it is the Great valley; more to the south it is called the valley of East Tennessee. At the northeast and at the centre, its average breadth is fifteen miles; it contracts in breadth towards the south, in Virginia, but reaches its greatest dimensions in Tennessee where it measures from fifty to sixty miles in breadth. The chain, more or less compound, which borders this great valley, towards the southeast, is more continuous and extends without any interruption from Vermont to Alabama. In Vermont it bears the name of Green mountains, which it retains to the borders of New York; in the latter State it becomes the Highlands; in Pennsylvania, the South Mountains; in Virginia the Blue Ridge: in North Carolina and Tennessee, the Iron, Smoky and Unaka mountains.

Although these features are common to the Appalachian system throughout its entire length, nevertheless, it may be divided from north to south into three divisions, which present very remarkable differences of structure. Passing the

eye over the physical chart which accompanies this article, we at once distinguish in the longitudinal extent of the Appalachian system two principal elevations, the one at the north from Gaspes to New York, the concavity of which is turned towards the southeast; the other at the centre, from the Hudson to New River in Virginia, with its concavity also towards the southeast; the third from New River to the southwest extremity of the system, the direction of which is nearly straight, or forming a gentle curve concave towards the northwest. These three divisions, diminishing in extent from the north to the south, are well marked, at the north by the deep valleys of the Mohawk and the Hudson, which break through the Appalachian system to its base and across its entire breadth; at the south by New River, whose deep valley, with vertical walls, also separates regions whose orographic characters present remarkable differences.

After describing the two northern divisions, he proceeds: "The southern division, from New River to the extremity of the system, is much the most remarkable for the diversity of its physical structure and its general altitude. Even the base upon which the mountains repose is considerably elevated. Although the elevation of the Atlantic plain at the eastern base of the mountains is only 100 to 300 feet in Pennsylvania, and 500 in Virginia near James river, it is 1000 to 1200 feet in the region of the sources of the Catawba. In the interior of the mountain regions the deepest valleys retain an altitude of from 2000 to 2700 feet. From the dividing line in the neighborhood of Christiansburg and at the great bend of New River the orographic and hydrographic relations undergo a considerable modification. The direction of the principal parts of the system is also somewhat changed. The main chain which borders the great valley on the east, and which more to the north, under the name of the Blue Ridge, separates it from the Atlantic plain, gradually deviates towards the southwest. A new chain detached on the east, and curving a little more to the south, takes now the name of Blue Ridge. It is this lofty chain, the altitude of which, in its more elevated groups, attains gradually to 5000 and 5900 feet, which divides in its turn the waters running to the

Atlantic from those of the Mississippi. The line of separation, of the eastern and western waters, which, to this point, follows either the central chain of the Alleghanies, or the western border of the table-land region, passes now suddenly to the eastern chain, upon the very border of the Atlantic plain. The reason is that the terrace which forms the base of the chains, and the slope of which usually determines the direction of the water-courses, attains here its greatest elevation, and descends gradually towards the northwest. The base of the interior chain which runs alongside the great valley is thus depressed to a lower level, and though the chain itself has an absolute elevation greater than that of the Blue Ridge, the rivers which descend from the summit of this last, flow to the northwest towards the great central valley, which they only reach in southern Virginia and North Carolina, by first passing across the high chain of the Unaka and Smoky mountains through gaps of 3000 to 4000 feet in depth.

The southern division thus presents from southeast to northwest three regions very distinct. The first is the high mountainous region comprised between the Blue Ridge and the great chain of the Iron, Smoky and Unaka mountains, which separates North Carolina from Tennessee. It commences at the bifurcation of the two chains in Virginia, where it forms, at first, a valley of only ten to fifteen miles in breadth, in the southern part of which flows New River; it then enlarges and extends across North Carolina and into Georgia, in length more than 180 miles, varying in breadth from twenty to fifty miles. The eastern chain, or Blue Ridge, the principal water-shed, is composed of many fragments scarcely connected into a continuous and regular chain. Its direction frequently changes and forms many large curves. Its height is equally irregular. Some groups, elevated some 5000 feet and more, are separated by long intervals of depression, in which are found gaps, whose height is 2200 to 3700 feet, but little above the height of the interior valleys themselves with which they are connected. The interior, or western chain, is much more continuous, more elevated, more regular in its direction and height, and increases very uniformly from 5000 to nearly 6700 feet.

The area comprised between these two main chains, from the sources of the New River and the Watauga, in the vicinity of the Grandfather mountain, to the southern extremity of the system, is divided by transverse chains into many basins, at the bottom of each one of which, runs one of those mountain tributaries of the Tennessee, which, by the abundance of their waters, merit the name of the true sources of that noble river. Between the basin of the Watauga and that of the Nolichucky, rises the lofty chain of the Roan and Big Yellow mountains. The northwest branch of the Black mountain and its continuation as far as the Bald mountain, separate the basin of the Nolichucky from that of the French Broad river. Between the latter and the Big Pigeon river stretches the long chain of the Pisgah and the New Found mountains. Further to the west, the elevated chain of the Great Balsam mountains separates the basins of the Big Pigeon and the Tuckasegee; next comes the chain of the Cowee mountains, between the latter river and the Little Tennessee.

Finally, the double chain of the Nantahala and Valley River mountains separates the two great basins of the Little Tennessee and the Hiawassee. The bottom of these basins preserves in the middle, an altitude of from 2000 to 2700 feet. The height of these transverse chains is greater than that of the Blue Ridge, for they are from 5000 to 6000 feet and upwards; and the gaps that cross them are as high, and often higher, than those of the Blue Ridge. In these interior basins are also found groups, more or less isolated, like that of the Black mountain, which, with the Smoky mountains, present the most elevated points of the system.

Here then, through an extent of more than one hundred and fifty miles, the mean height of the valley from which the mountains rise is more than 2000 feet; the mountains which reach 6000 feet are counted by scores, and the loftiest peaks rise to 6700 feet, while at the north, in the group of the White mountains, the base is scarcely 1000 feet, the gaps 2000 feet, and Mount Washington, the only one which rises above 6000 feet, is still 400 feet below the height of the Black Dome of the Black mountains. Here then, in all respects, is the culminating region of the vast Appalachian system."

The basins above described by Prof. G., are all valleys of erosion,—*i. e.*, they have been excavated by the force of the rivers which flow along their bottoms. And it is this same force which has hewn a way for these rivers out of these basins, cutting down deep channels for themselves through the lofty and massive chain of the Smoky and Unaka mountains, which form their northern boundaries. There are two remarkable points in this river and mountain system. One is, that while in the northern division of the Apalachian system, in Virginia, for instance, the rivers, rising in the more westerly chains of the system, cut through the Blue Ridge and make their way *east*. In North Carolina, on the contrary, they rise in the Blue Ridge and cut their way *west* through the Smoky. The other is, that these rise in the *smaller and lower* chain and cut through the *higher and more massive*. The probable cause of this will be considered further on.

The largest of these basins are those of the French Broad and the Hiwassee, the former having an average elevation of a little more than 2000 feet, the latter, a little less. The smallest, and at the same time, the most elevated, are those of the Pigeon and the Nolichucky, the elevation of both rising above 2500 feet.

GENERAL GEOLOGY.

The Strike (or direction of the outcrop) of the strata of this region corresponds neither to the general direction of the Blue Ridge, nor to that of the Smoky, and is subject to considerable variation. The general average will fall very near N. 50° E. In the slates of Cherokee it is less,—not far from 43°; and through the central portion of the region the average would probably be nearer 60°. A careful study of the range of the Blue Ridge through this region, will show that its principal masses, although loosely and irregularly attached to each other, manifest individually a disposition to fall into parallelism with the direction above set down as that of the average strike. This, therefore, may be considered as the direction of its controlling axis and of its constituent elements.

The Dip. The strata, through the entire mountain region, are inclined to the horizon at a high angle, the average dip falling probably near 65° , and the prevailing direction of it being southeast. It is subject, however, like the strike, to great variation, both as to its amount and direction, being frequently vertical and northwest.

These irregularities, both of strike and dip, are greatest along the middle portion of the mountain plateau, instead of being found chiefly, as we should expect, along the limiting mountain axes; and they are quite unaffected, apparently, by the subordinate north-and-south cross-chains, except in the case of the Nantehaleh mountains, along which, particularly near the northern termination of the range, the strike is deflected much to the north, and the dip also greatly disturbed and very variable. This central area of extraordinary disturbance is also characterized by an unusual degree of contortion and folding of the strata. Within this area lies a narrow belt, its breadth varying from 5 or 6 to near 20 miles, extending from the Black mountains across the State to the southeastern corner of Clay county, in which the prevailing dip appears to be northwest. This implies the existence of both an anticlinal and synclinal axis, the former along the southern, and the latter on the northern limit of this belt. It will require further observation and a laborious investigation of details to develop these points satisfactorily.

The Rocks. The central belt above described may be considered as including the geological axis of the plateau and may be properly called its axial zone. This zone is not less peculiar in the *character* than in the *disturbed condition* of its rocks. These belong to the *granitic*, more properly the *gneissic* series, and are characterized by an extreme degree of *metamorphism*, or alteration, and are hence frequently called *metamorphic* rocks. The southern boundary of this zone passes near and to the south of Whiteside, Hogback, Tennessee Ridge and Pisgah mountains, about 10 miles east of Asheville, and strikes the Blue Ridge again a few miles north of Swannanoa gap. Its breadth is from 20 to 25 miles, its northern limit, passing just north of Marshall, Fine's creek, Cowee creek and Shooting creek. Within this area are no

sandstones or clayslates, but an abundance of hornblendic and magnesian rocks. Hornblende slates, syenite, chlorite schists and serpentines occur in frequent and heavy beds throughout this belt, from the mouth of Shooting creek to the Yellow mountains. The chlorite schists and serpentines are generally accompanied by hornblendic rocks, and always associated with and often replaced by tremolite, soapstone, pyroxene, talc slates and actinolite rocks, and are frequently interlaminated with cellular quartz (burrstone) and contain at several points beds of chromate of iron.

True granite is found occasionally in the southern portion of this belt, rarely in the middle, and scarcely at all in the northern. Along the northern range of the belt also, the hornblendic strata are more infrequent, and the magnesian rocks almost entirely wanting, but there is an abundance of grey quartzose slates and gneiss, with pyritiferous mica schists.

These are succeeded, on the north of the axial zone, by a series of slates, argillaceous, silicious and talco-micaceous, which occupy a broad belt across the lower half of Clay county and the middle of Cherokee, and strike the Smoky mountains in the northern part of Macon. These slates are traceable along the east flank of the Smoky on Oconaluftee, across Haywood county a few miles below Fines Creek, and they appear on the French Broad 7 or 8 miles below Marshall, and continue to the State line, the silicious slates receiving here their greatest development, being in fact the dominant member of the group on the French Broad. With these slates are associated a few thin beds of fine conglomerate and grit rocks on the head waters of Valley river, which re-appear with them throughout their whole extent, becoming on French Broad and Shut In creek, a coarse conglomerate of many rods in breadth. Limestone also occurs in this series along the course of Valley and Nolteley rivers.

The western part of Cherokee, from a point on Hiwassee 3 or 4 miles below Murphy, is occupied by a succession of conglomerates and grits, interbedded with mica slates and schists, and talco-micaceous slates, abounding in garnets and staurolites, and occasional beds of grey quartzose slates and gneiss,

especially near the Long Ridge mountain. Blue and drab slates occur with the conglomerate at the State line on the Unaka mountain, and for several miles east. The conglomerates and grits of this series recur in heavy and frequent beds throughout a cross-section of near 20 miles, and are traceable across the highest peaks of the Unaka (or Unakoi) and again on the Tennessee river in the Smoky.

Along the southeast boundary of the metamorphic or axial zone, we have a narrow belt of slates, micaceous, and arena, carrying a thin bed of limestone. This limestone is traceable continuously from the Forks of Toxaway to Cane creek, disappearing in the Blue Ridge near Swannanoa gap, and cropping out again on North Fork in McDowell County.

South of the limestone belt comes another band of gneiss, grey and light colored, which is some 10 miles in breadth, and is followed by another body of hornblendic and silicious slates, with occasional mica schists and gneiss.

Drift. Although this region is far beyond the limits which geologists usually assign to glacial action, yet there are throughout these elevated plateaus numerous phenomena which have no other plausible explanation. Accumulations, many feet deep, of unstratified earth with smooth rounded stones, (mostly of quartz and other hard rocks,) are found every where through these basins, often capping high ridges and knobs one or two hundred feet above the present beds of the rivers. Such a bed is found on one of the hills overlooking the town of Asheville, near 200 feet above the French Broad. Some of the pebbles of this bed, I have traced to their origin about six miles to the south. On the slopes of the mountains along Valley river, such drift masses are common and extensive, many of the smoothed and rounded masses of quartz weighing nearly a ton.

Terraces are also occasionally discoverable, though not common. The most notable example that came within my observation is found along the French Broad, from Warm Springs to the State line, occurring at intervals for several miles, in three or four benches, ten, twenty-five, fifty and one hundred and fifty feet in height.

Age of the Rocks. The facts above stated are sufficient to

indicate that these rocks belong to the most ancient of the azoic series. The intensity of the metamorphism, the characteristic rocks and their contained minerals, together with the total absence of any thing like organisms in even the least altered and latest of the series (in Cherokee for example) render this conclusion inevitable. And not only do they belong to the lowest geological horizon, but the entire absence of all representatives of the later formations makes it further necessary to conclude that we have here an extensive tract of the oldest land on the globe; and as North America is the eldest-born of the continents, so the Black mountain is the eldest of its giant brotherhood, and was the first to emerge from the face of the unbroken sphere of waters, when the command went forth "*Let the dry land appear.*"

The facts above given, also point to the explanation of the remarkable relation of the river system of this section to its mountains, viz., that they rise along the smaller, and break through the greater range. This explanation is probably to be found in the relative age of the two chains, as ascertained from that of their component rocks, the Blue Ridge being the more ancient, and having determined the courses and channels of the rivers before the rise of the Smoky.

ECONOMICAL GEOLOGY.

The mountain section of North Carolina, has not been hitherto known to the world as a mineral region. And yet it contains several well marked mineral tracts whose riches are not surpassed in any other part of the State or country. Such are the limestone belt of Cherokee, with its marble, iron and gold; the copper belt of Jackson, and the iron beds of the Yellow mountains. It will, perhaps, be more intelligible to consider separately, the several minerals which occur in valuable accumulations in this section. And first.

LIMESTONE.

The value of this mineral is not yet appreciated by our farmers. Its importance in an agricultural point of view

it would be difficult to overstate. Dr. Hitchcock, in his report of the Geological Survey of Vermont, says of a discovery which he made of a limestone bed in that State, "This is a treasure which Providence has hidden in the earth and provided for its elimination at the right time and in the right quantity, and it is of far more value, in my estimate, than all the other subterranean wealth of the State." I am not sure that this should be regarded as an extravagant statement, if applied to this State, rich as it is in other minerals. I have, therefore made it a point to search for this rock, wherever there was the least prospect of its discovery. The most extensive and valuable limestone belt in this region is that of Cherokee. As already stated, it is found in a heavy body of slates, and consists of three or four distinct beds, separated by slates, and occupying a variable breadth of two to five miles. It extends from the Ocoee river into and across Cherokee, lying along the valleys of Notteley and Valley rivers, quite to the sources of the latter, and re-appearing on the Nantahaleh river in Macon county. It crops out along the banks and beds of the streams, in the fields and roads and the bluffs overhanging the rivers, so as to be easily accessible and convenient for agricultural purposes.

There are three other beds of limestone in the mountain region, all of them crossing the French Broad. The most important of these, both on account of its extent and its location, is the Cane creek and the Toxaway bed, which passes near the mouth of Muddy creek. Lime is extensively manufactured along the line of this formation, many thousand bushels being distributed annually from one kiln, over the neighboring farms, the value of which has, by this means, in many cases, been already more than doubled. A second belt crosses the river near the mouth of Bear Creek, about two miles below Marshall. This is a crystalline rock, a true marble, but rendered unfit for ornamental purposes, at the few points where I saw it, by the presence of crystals of a magnesian mineral. This is a thin bed, only a few rods in breadth and lies along Walnut and Bear creeks; with a subdivision, probably crossing the river at the town of Marshall. The third belt is found in heavy outcrop at and below Warm

Springs. This is a compact, blue and gray limestone, scarcely crystalline.

MARBLE.

I have no statistics at hand to show the quantity of this material, which is annually imported into this State from the quarries of Massachusetts and Vermont, and the amount of money which passes beyond our borders in payment; but any one who has occasion to observe the amount of business which is done in our marble yards, and still more who will consult the census returns to see how many scores of vessels and how many thousands of laborers are employed in the two States above mentioned, to furnish us and our neighbors with ornaments for our homes and monuments for our dead, will be surprised at the magnitude of both these items. If this were inevitable, there would be no profit, or propriety in speaking of it here. But the fact is far otherwise: for we have within our own borders an abundance of marble, equal to the best imported article. The limestone of Valley river is all marble, although it is not everywhere sufficiently free from flaws and impurities for ornamental uses. There are several quarries, however, where the rocks crop out in masses of fine quality and grain. The track of the proposed rail road lies along the line of these quarries, and will be built, for many miles, upon beds of solid marble. It is of several shades of color, generally white and blue to bluish-grey. I have seen specimens also of a fine mottled (blue and white) variety, from the head of Valley river. But the finest grained and tinted specimens are found on Red Marble creek and Nantehaleh river. The most beautiful shades are grey, and rose, to flesh colored. I have seen no marbles from any part of the world superior to these.

IRON

Is found, in some of its various forms of ore, in most of the western counties, but its most important localities are Cherokee and Mitchell. These are worthy to be mentioned with the Iron mountain of Missouri. The iron ore of Cherokee belongs

to the class known as hematite. It occurs along with each of the parallel subdivisions of the limestone, sometimes on both sides of them. It outcrops in immense masses along Nolteley, on Hiawassee at the junction of Valley river, on Peachtree creek, and the whole length of Valley river, an aggregate distance of twenty-five miles. One of these beds, which appears on Peachtree, is a soft, uncompacted brown ochre, which has been mined for paint. This bed is well developed in the upper portion of the valley of Valley river, on Paint creek, and again above Valletown. The ores from many of these beds have been wrought in the common bloomeries of the country, (of which there were, perhaps, half-a-dozen in the county,) and even under this mode of treatment, are said to yield a large per centage of metal of good quality. And those beds of slaty ore, which are not workable in such open forges, would be easily smelted in a blast furnace.

It is apparent, therefore, that there exist in Cherokee county, the most favorable conditions for the manufacture of iron on an indefinite scale. Three large rivers flow along and over the edges of these *iron mountains*, furnishing unlimited power, and at all points; the ore is interstratified with limestone for fluxing; and the neighboring mountain slopes abound with fuel. And if this were not sufficient, the distance is only twenty-five miles to the State line, where a rail road will shortly bring mineral fuel from Chattanooga. Nothing is wanting but transportation, to develop here a manufacturing interest equal to any on the continent.

The other principal iron bed is that of Mitchell county, near the head of Toe river. This ore is found in the gneissic series of rocks, and is magnetic, or *grey ore*. It occurs in an immense bed of hornblende slate and syenite, near the base of the Yellow mountains and a few miles from the State line. The outcrop is on the lower slope of the mountain, perhaps 200 feet above its base, and reveals a network of heavy "veins," or beds, extending over several acres of surface. It is inexhaustible in quantity. The iron manufactured in the bloomeries of the neighborhood has been long celebrated for its tenacity and durability, and is admirably adapted to the manufacture of steel. It is known as the Cranberry iron, from a

small stream near the ore banks. Here, also, exist the best natural facilities for the manufacture of iron. Water-power and fuel in the greatest profusion are at hand, and the only difficulty here too, is in the matter of transportation, which, however, could be readily overcome.

Magnetic ore is found in many other localities, and no doubt this Cranberry ore will be discovered in other outcrops in these mountains. Ore of the same character, appears at the western base of the mountain, at Flat Rock, which is probably a continuation of the same series of beds. Magnetic ore occurs near Marshall also, in Madison county, and again near Fines creek, in Haywood; in each case, having the same association of hornblendic rocks. It is also found in Macon county at several points, here in a garnetiferous mica schist. Hematite ore occurs at one or two points in Buncombe, and a bed of it also overlies the limestone in Transylvania county, appearing again with it on the North Fork in McDowell. This association with limestone, which occurs so frequently, is not accidental, but points to the origin of these ores.

GOLD.

There are two principal "gold regions" in the mountain section, one in Cherokee, the other in Jackson. The gold belt of Cherokee is in the same body of slates which carries the limestone and iron. It is found both in veins and superficial deposits. The sands of Valley river yield profitably through a large part of its course, and some very rich "washings" have been found along its tributary streams on the north side. The origin of this gold is very near the limestone. A remarkably rich vein has been opened near the town of Murphy, known as No. 6, which immediately underlies the marble. This is a silver-lead quartz vein, in which is embedded a large per centage of free gold. There is a strong probability of other similar veins having furnished the golden sands of the river and streams above mentioned.

On the southeast of the limestones is also a series of "diggings" along the lower slopes of the mountains, from near Valletown to Vengeance creek, a distance of 12 or 15 miles.

The gold is found here in the drift which covers the lower spurs and terminal ridges of the mountains lying south of Valley river. The drift-beds have a depth of 10 to 20 feet and an elevation above the river of 150 to 200 feet, and are remarkable for the great size of their quartz boulders and their very large and abundant stannite crystals. These last indicate, with a good degree of probability, that the gold here is derived from the talco-micaceous slates, (several miles to the southeast) where these crystals are found in place.

At one point, the Parker mine, extensive arrangements had been completed at the opening of the war for working these deposits by the hydraulic, or hose process. For this purpose water was conveyed three or four miles along the face of the mountain in canals and aqueducts so as to gain the necessary elevation.

The continuation of this gold belt southwestward across the country, is rendered probable by the existence of several valuable mines in this direction beyond the Hiwassee, as the Warren mine on Brasstown creek and others on Nettleley river, in the edge of Georgia. These being vein mines, may, on a proper investigation, lead to the discovery of the original source of the deposits above described.

The gold of Jackson county is also obtained almost entirely from "washings." These are situated chiefly along southern slopes of the Blue Ridge, near Hogback and Chimney Top mountains. The most important locality is Fairfield Valley, where Georgetown creek, one of the head streams of the Toxaway, is said to have yielded between two and three hundred thousand dollars. The deposits extend several miles along these elevated basins and have by no means been exhausted. The origin of the gold here is doubtless to be sought in veins in the Blue Ridge, which rises as a precipitous wall of grey gneiss, sheer up from the valley 7 or 800 feet, on the north and east; and it is along the base of this wall, where Georgetown creek has cut a deep channel across it, that the gold is principally obtained. The deposits in Transylvania county east of the Blue Ridge, on the head waters of French Broad, will probably be found to have the same origin, and are probably a continuation of the same belt.

COPPER.

I am not aware of the existence of copper in the mountain section, except in what I have called the Jackson belt, because it is in this county that the formation receives its principal development, although it crosses the whole breadth of the State, and has yielded copper at several points in Macon, on the one side, and Haywood on the other.

The general character of the formation has already been given. The feature, which it is most important to recall, as worthy of special attention, is the existence of numerous beds of syenite and hornblende slate throughout the tract. The relation of these to the magnetic iron ore has already been pointed out. They also carry the copper. All the copper mines I have seen in this region show this peculiarity. These deposits seem, in fact, not to be the true *veins* in the technical sense, (although they are in the popular) but *impregnations* of ore, of the same class with those of the Ducktown mines; but belonging to an entirely distinct age and system of rocks. The copper belt occupies the whole middle portion of Jackson county, from the head waters of Tuckasegee river, northward to Scott's and Savannah creeks, and probably several miles beyond. None of the deposits have been properly opened and exposed, so as to afford an opportunity for a full and satisfactory examination; but so far as this has been done, many of them are of the most promising character, and the "veins" are of unusual size. The principal points where mining operations have been carried on are Cullowhee, Waryhut and Savannah, although work has been done and symptoms of the presence of copper discovered at many other places, as Shell Ridge, Scott's creek, Sugarloaf, Panther Knob, Wolf creek, &c.

The ore at Cullowhee, where the best exposure has been made, (although only the surface of it has been touched even here) is eight or nine feet thick; at Waryhut, five or six feet; at Savannah, where there are several "veins," or beds of ore, the largest which has been opened is nine or ten feet. In several of the above localities copper was found within a few

feet of the surface. The outcrop in all cases is the mineral known among miners as "gossan," really an ore of iron, (limonite or hematite) and has resulted from the *weathering* and decomposition of the exposed ore, which is "yellow copper," or copper pyrites, from which the copper and sulphur have been removed to a considerable depth by the chemical action of the atmosphere.

"Gossan" occurs at many points throughout the Jackson county belt, the beds running with the strata, northeast and southwest, in some cases a single bed being traceable, interruptedly, almost across the breadth of the county. Such an outcrop is visible on Chink Knob near Tennessee Ridge, associated with a heavy bed of hornblende slate, and also accompanied by a garnetiferous mica slate.

These copper deposits will, no doubt, under a judicious system of mining, (*not speculation*) give rise to many valuable mines. This will require capital, however, which of course will be slow to seek investments here, until means of transportation to market shall have been provided.

Here is undoubtedly one of the most interesting mineral regions of the State, both scientifically and economically, and it merits a thorough exploration; which of course I could not give it in the two weeks devoted to this county.

In the above brief sketch of a few of the more important minerals and mineral localities of this region, of course many points have been omitted which are of great interest to the Geologist and Mineralogist, because time does not allow me to introduce them here. In fact this description is too hurried to do justice even to the practical aspects of the subject; and many points which my rapid survey did not permit me to examine at all, have been reserved for future investigation.

AGRICULTURE.

A few observations of a general character is all that can be attempted here.

Climate. The latitude of the middle of the mountain plateau is about $35\frac{1}{2}^{\circ}$, and the average elevation over 2000 feet; and since 500 feet of difference of elevation are about

equal, in climatic effect, in the temperate zone, to 1° of difference of latitude, the climate will be found to correspond to that of northern Virginia and southern Pennsylvania.

Soil. From the description already given of the rocks, the general character of the soil may be readily inferred. A peculiarity which strikes all strangers on first visiting this section is that the mountains are clothed, quite to their tops, with the heaviest forest growth. And where this is not so, those which are bare of trees, are covered with a crop of indigenous grasses. It is seldom that bare rocky summits are seen, as is so frequently the case further north, in the White mountains for instance. These facts indicate at once the presence of a substantial soil, even at the greatest elevations. Its average quality for the whole section is quite equal to that of the middle region of the State; and the alluvial soils along many of the rivers will compare favorably with the best lands in the country.

Timber is found every where in the greatest variety and abundance. In addition to the oaks and other species which grow further east, there are here, in many localities, forests of sugar maple, walnut, wild cherry, white pine and black locust, and other timbers which will one day become an important source of business and profit.

Products.—Corn, oats, rye and the common potato flourish throughout this region, and constitute the staple products.—Wheat does well in several counties, particularly in Madison and Haywood. The grasses, especially timothy, herd, orchard, blue, and clover, grow luxuriantly. The highest mountain summits, ridges and plateaus are natural meadows; good summer range is abundant everywhere, and there are large tracts on the higher table lands, where are two or three species of grasses which remain green through the winter.—Hence cattle and sheep-raising are among the most profitable occupations.

There is probably no better region for fruit in the United States. Apples grow almost spontaneously, and there are many seedling varieties which have originated here, that are equal to the most celebrated exotics. And I have seen apples of good quality growing wild on the tops of mountains

nearly five thousand feet high, where the seed had probably been accidentally dropped by the hunter.

Tobacco also, flourishes remarkably in this region. Indeed I do not remember having seen it grow better anywhere than in Cherokee, for example. And from the abundance of feldspar in the rocks, and hence of alkali in the soil, (as is also evidenced by the remarkable prevalence of hickory growth,) of the southern half of Jackson county, this section also will no doubt, be found to be specially adapted to this crop. Here is then the suggestion of a new industry which might become an important resource to the inhabitants.

Probably more than \$100,000 are annually put into circulation in the mountain region, in payment for indigenous medicinal roots which are gathered chiefly in the rich coves and on the highest ridges. Among these are ginseng, snake-root of several species, and pinkroot. The first named is the most important, and has long been the basis of a considerable trade. I was not able to get a reason for the neglect to cultivate this valuable plant, and could not learn that the experiment had ever been tried. The high price which it bears and the large and constant demand abroad would certainly justify such an effort to improve so obvious a hint of nature.

CHAPTER III.

A BRIEF SUMMARY ON THE MINERALS OF NORTH CAROLINA.

The result of the different surveys and explorations which have been made up to this time, are scattered, as we have seen, through a series of reports and documents by different authors, and at times considerably distant; some of them are out of print and all of them scarce, so that possibly not half a dozen individuals—perhaps hardly two libraries in the State possess them all.

A brief resume, or condensed statement seems therefore to be required, of at least those results which have an immedi-

ate practical bearing upon the development of our mineral resources. For want of time to prepare a fuller and more comprehensive account of the whole survey, the following very concise summary on "The Minerals of North Carolina" is given. It is substantially the same paper which I prepared for publication a short time before undertaking the present survey. The substance of it, therefore, with the exception of some points relating to the extreme western portion of the State, with which I became acquainted in the course of my exploration during the past season, has already been given to the public in another form.

A statement of some general principles, and a few observations on the leading geological features of the country, will make the subject more intelligible. The position, general arrangement and condition of the rocks of a region have always an intimate dependence on its mountain systems. The strike, or direction of out-crop of the strata, may generally be predicted as soon as the direction of the dominant mountain range is ascertained. Thus the different beds of rocks on the eastern side of our continent fall into parallelism with the axis of upheaval of the Appalachian system. The general direction of the Blue Ridge, therefore, gives us approximately the geological meridian to which all the rocks of North Carolina must be referred. This direction is nearly north-east and south-west. Every one has noticed that the edges of the outcropping strata, and in general the trap dykes and mineral veins, take this direction predominantly in our latitude. The beds of slate, limestone, gneiss, &c., follow each other in regular succession, all trending away to the north-east. So that in passing from the sea coast to the mountains, we cross successively in our track the upturned edges of the whole series. Thus we have the clue to the distribution and arrangement of the rocks in mass.

In the study of the metalliferous minerals, it is important to bear in mind two leading facts: first, that they are found, especially the precious metals, chiefly on the flanks of mountains and in tracts marked by disturbance and upheaval, in the vicinity of trap dykes and other eruptive rocks, and at the intersections of these with slates; and second, that their oc-

currence is most frequent in the oldest formations, the Primary and lower Secondary.

The rocks of North Carolina belong to this lowest horizon, being wholly included, with the unimportant exception of the coalfields, in the Primary group. So that we are prepared for the statement that there is hardly to be found a territory of the same extent, with so great a variety of valuable minerals. In the treatment of this subject, it will be sufficiently precise for our purpose to divide the useful minerals into two classes, namely, the metalliferous ores, which occur mostly in veins, as gold, copper, &c., and earthy minerals and rocks, which are found mostly in beds, as coal, limestone, &c.

Under the first division, occur gold, silver, copper, lead, zinc, iron and tungsten, and here, for convenience, may be added the diamond; and under the second, may be mentioned, as occurring in this State under such circumstances, as render them economically valuable, coal, marl, limestone, marble, architectural granite, sandstone, porphyry, fire-stone, burstone, grindstone grit, whetstone slate, roofing-slate, alum and copperas slates, soapstone, serpentine, agalmatolite, fire-clay, graphite, garnet, barytes, manganese, oil slates, and chromate of iron.

COAL.

The second division, being most important, will first claim attention; and first among these coal.

The value of this mineral is too well known to require statement even. The development of all arts and industries is connected with its abundance and cheapness. It is found in two districts in North Carolina, known as the Deep River and Dan River coalfields. In both, the coal is bituminous, and occupies a narrow tract of country along the course of the rivers from which they respectively take their names.

These beds, therefore, follow in their outcrop the general direction of the rocks of the country. The Dan River bed is distant from market, and has been little explored. There is an outcrop in Rockingham and Stokes counties, one seam being four feet thick. The Deep River bed is better known,

and probably more extensive. It is described in detail, in the Geological Reports of Dr. Emmons, for 1852 and 1856, and also by Admiral Wilkes, in his report to the Secretary of the Navy, in 1859. According to these authorities, this coal is of the best quality, well adapted to the manufacture of iron and gas, and is inexhaustible in quantity. They represent it as extending over an area of more than forty square miles, and containing more than 6,000,000 of tons to each square mile. This bed, therefore, would yield 1,000,000 tons annually, for several hundred years.

OIL.

These North Carolina coalfields are cotemporaneous with those of Virginia, and belong to an age more recent than the Apalachian coal formation, which ranges from Pennsylvania to Alabama. They belong to the later ages of the Secondary.

The bituminous slates associated with the coal are strongly impregnated with organic products. Dr. Emmons says, "From thirty to forty gallons of crude Kerosene oil exist in every ton of these slates. They are from fifty to seventy feet thick, and it is proper to state, that it is a better oil than is furnished from coal." The coal lies in a trough-like depression, which extends from Granville county, in a south-west direction, into South Carolina. This tract is occupied, in its whole length, by a heavy bed of sand stones, of the same age with the coal. They are identical in appearance, quality and age, with the brown-stone of Connecticut valley, which is so extensively used as a building stone in New York and elsewhere. These sand stones are also extensively quarried for grindstones, for which they are well adapted.

FIRE-CLAY, &c.

Beds of fire-clay, also, are interstratified with the coal.—This mineral is found in various parts of the State, conspicuously in Gaston county. There are five or six parallel belts of sandstone and quartzite, belonging to the older rocks, which traverse the State in the prevailing direction, and in

which are found various grades of building-stones, fire-stones and grindstones. According to Dr. Emmons, one of these passes eastward of Raleigh, another a few miles to the westward, and a third crosses the counties of Montgomery, Randolph and Orange. The well-known fire-stones of Gaston, Lincoln and Catawba, occur in the fourth belt, which crops out along the line of upheaval of King's mountain, Crowder's mountain and Little mountain. This rock in places assumes the character of white granular quartz, (saccharoidal quartz of the mineralogist) and attain sufficient purity to be used in the manufacture of glass. Linville mountain, in McDowell county, at the eastern base of the Blue Ridge, is chiefly made up of the same rock. Here is found the flexible sandstone (Itacolumite of the mineralogist) in which the diamond occurs in other parts of the world.

LIMESTONE.

In addition to the four beds of this rock in the western counties, there are two beds east of the Blue Ridge; one is in McDowell county, along the North Fork, the other crosses the State from King's mountain, along through Gaston, Lincoln and Catawba to Stokes. There is also a small bed of marly limestone eight or ten miles in length in the north-western part of Wake county.

PORCELAIN CLAY, &c.

Agalmatolite constitutes another member of the sandstone group in at least two of the zones, being found in this connection in Montgomery and Chatham, as well as on the Nantehaleh river, and across Cherokee county. This rock is mis-called soapstone, which it resembles in some of its properties and uses.

It is developed here on a large scale, and in no part of the world is found in greater purity or extent. Its uses in the arts are manifold, being substituted for graphite in lubrication, and for soap-stone in furnaces, prepared as a cosmetic and a pigment, and manufactured into soap, into ornaments,

and the finer kinds of porcelain ware. It has been exported for this latter purpose in large quantities to New York, and to Germany.

GRAPHITE.

Here, also, belong the famous graphite, or plumbago beds of Wake county, being found immediately under the sand stone, or quartzite. It occurs, likewise, in the same connection, in the Catawba belt, and scattered through several counties westward. The uses of this mineral are well known and important, the principal of which are, for the so-called lead pencils, for crucibles, for paints, for lubrication and for electrotyping, &c. The Wake county mines have been worked to a considerable extent, and will, no doubt, be re-opened. Dr. Emmons and Prof. Olmsted pronounce these the most important beds of this mineral known.

The quartz rock of this group in Montgomery, takes the form of a buhrstone, which is supposed to be valuable for the manufacture of millstones. This mineral is also found near Webster, in Jackson county, and on Nantehaleh river, in Macon.

SOAPSTONE, WHETSTONES, &c.

Soapstone and serpentine of good quality are found in various parts of the State, for example, in Wake, Moore, Orange, Randolph, Mecklenburg and Caldwell, and west of the Blue Ridge, there is a remarkable dyke of serpentine and chlorite slates, traversing the State from Clay to Mitchell, which carries a great variety of minerals, interesting to the mineralogist, and one at least that might become valuable economically.

Here is one of the few veins of chromate of iron found in the United States. This mineral yields a larger number of valuable paints than any other substance known. The slate formation, which occupies a tract of the State, not less than forty miles in width, lies west of the coal rocks of Deep river, and extends in a north-east direction, from Anson and Union counties on the southern border, to the Virginia line. These

slates constitute a notable feature in the geology of the State, and, in addition to the interest which attaches to the numerous mines along its north-western border, they contain extensive beds of roofing-slates, whetsone-slates and turkey bones, (novaculite.) Scythe-stones are also found on the Nantehaleh, of good quality and in great abundance.

ALUM AND COPPERAS.

Alum and copperas slates abound in many parts of the State, and have been extensively brought into requisition during the stress of the late war. The counties of Cleveland and Rutherford alone contain not less than 100 square miles of these rocks, and could easily supply the continent with copperas. This material is derived by the process of weathering, from the iron pyrites which is disseminated in great abundance, and in a state of extreme comminution through the slates, many of which, being feldspathic, yield also alum.

MINERAL SPRINGS.

The pyritous character of these rocks accounts also for the numerous mineral springs, sulphur and chalybeate, for which this region is noted. Among these, Wilson's springs are the best known. They belong both to the white and red sulphur waters, as they are called, and have no superior in Virginia or elsewhere. Mineral waters are not limited to this region, however. No section of the State is destitute of them, and in the mountains they are found every where.

BARYTES

Is found in Orange, in the mines of Cabarrus and Mecklenburg, also in Gaston and Madison counties; and manganese in Cabarrus and Gaston as well as in Lincoln, Catawba and elsewhere.

MARL.

This valuable material is liberally scattered over most of the seacoast section of the State, and is found in every degree of purity and consolidation, from a mere aggregation of loose shells to the most compact limestone, suitable for building, or for burning into lime. The famous Bath stone of London is matched by some of these beds. The marl is generally found near the surface and easily accessible. The importance of these accumulations of mineral manure to the agriculture of the State is not fully appreciated. Our farmers are only beginning to understand the essential part which lime plays in the economy of vegetable growth, and its important relations to exhausted soils.

We pass to the other division of minerals, the metalliferous ores.

To the unpracticed eye, nothing presents a picture of more hopeless disorder and chaos than the rocks, particularly in a region of great disturbance, as in a mountainous country. Here seems truly "A land of darkness, without any order, and where the light is as darkness." And yet, at the touch of science, order rises out of this confusion, and light spreads over this darkness. In a region of the wildest riot of disorder, dislocation, disturbance, and inversion, under the patient and inevitable inductions of geology, the upheaved, overturned, and distorted strata fall into rank and regularity along certain axes and group themselves orderly about certain centres. As the sandstones, limestone, &c., of the previous division were found to acknowledge certain relationships *inter se*, and toward a controlling geological meridian, so it will appear that the metalliferous ores are not scattered at random and as if by chance, (even within the limitations already stated, of a disturbed area and a low geological horizon) but have a subordinate grouping and a palpable arrangement.

IRON.

And first of iron, king of metals; so, because it constitutes the very frame-work, as it were, of our material civilization, without which the whole fabric would vanish like the fabled ship on approaching the magnetic mountain. North Carolina is peculiarly fortunate in the possession of an abundance of iron ore, and so widely distributed and in so immediate juxtaposition with the other materials and means for smelting it, that each section, except the sea-board counties, can produce its own supply. These ores occupy chiefly five or six narrow tracts, or districts, which have an obvious relation to the mineral belts already pointed out.

This relation is most obvious and most immediate in the trans-Catawba tract, the ore being found in heavy veins along the outcrop of the sandstone from King's mountain through Gaston, Lincoln and Catawba, to Stokes and Surry. A second belt extends through Montgomery, Randolph and Guilford. A third has its largest development in Chatham in the neighborhood of the coal, but makes its appearance also in John son and Orange.

In the coal-beds themselves, according to the high authorities already cited, exists an important deposit of iron ore interstratified with the coal. West of the Blue Ridge, and not far from the sandstone belt, is one of the most valuable accumulations of iron ore to be found in the country. It has been long famous for the fine quality of the metal which it yields. The ore lies at the base of the Yellow mountain in Mitchell county, and is found at several points in a south-west direction in Madison and Haywood.

Another bed accompanies the limestone of McDowell and Transylvania, and one of the most important and extensive deposits in the country, crosses the entire breadth of Cherokee. It will doubtless be found elsewhere in the further investigation of the minerals of this almost unexplored mountain region. The ore is found at several points outside of these well marked districts. It belongs commonly to the variety known as magnetic. To this, however, there are many exceptions. Specular or hematite ore often replaces it, or is as-

sociated with it. The ore at several of the points mentioned is well adapted to the manufacture of steel.

The manufacture of iron had attained to considerable importance in the State previously to the late war, during which, of course, this industry received a great impetus. And when our system of Internal Improvements shall have been completed, this will doubtless become one of the most important manufactures in the State.

GOLD.

Gold mining commenced in North Carolina about fifty years ago. The first impulse was given to the business by the accidental discovery of some large nuggets in Cabarrus and Anson counties. Previously to the year 1820, not more than \$50,000 had been obtained. In 1863, the aggregate yield was not less than \$10,000,900; which would make an average annual yield of \$250,000. The larger part of this was obtained from a small area comprising about half a dozen counties, lying chiefly along the Peedee and lower Catawba, but extending north-east from Mecklenburg and Anson to Guilford. Here, as elsewhere, the first mining was confined to "surface-diggings." And in 1824, Professor Olmsted, of the University, then State Geologist, expressed doubts about the existence of gold veins in that region.

In California, Australia, along the Andes and the Ural,—everywhere, in ancient and modern times, these superficial deposits have been the chief source of the precious metal, and have been generally more remunerative than vein-mines. And it is in this detritus of sand, gravel and clay, that nearly all the large masses, or nuggets, of gold have been found. They seldom occur in veins, although these detrital accumulations are doubtless the debris of denuded veins. In North Carolina, however, vein-mining soon obtained great prominence; and the larger part of the whole product in this State has been derived from this source. Some single mines in the gold region have yielded from one to two millions. And if these mines have not been uniformly profitable, it is because they have been generally wrought with little science, or

economy. *Overman, in his work on Metallurgy, has recorded his conviction that these mines, under proper management, would be more profitable than those of California.*

Although the mines are more numerous and important in the region indicated, yet they are by no means restricted to so narrow a district. Many valuable mines occur far outside of this "gold region," as in Moore and Franklin, on the east, and in Gaston, Catawba, Burke, Jackson and Cherokee.

The vein-gold of this State is usually found in a gangue of quartz, or disseminated in a slaty veinstone; and is commonly associated with iron and copper pyrites. This association almost universally prevails below the water-level. These mines, therefore, are of the same character as those of California and Colorado, and the new methods which have been devised during the last few years, to meet the difficulties of working this class of ores will doubtless be found applicable here.

SILVER.

It will be observed that the richest gold mines lie along and near the line of contact of the slates and granite. And it is also along this line that the principal silver mines of this State are found. The most noted of these is at Silver Hill, in Davidson county. The combination of metals here is quite complex,—including, with the silver, gold, lead, copper and zinc. A chain of similar mines runs south-west along the western border of the slates, including the McMakin and Stewart mines. During the war, the first named of these mines yielded a considerable quantity of lead. It had been previously worked chiefly for silver and gold. The same association of metals occurs in Cherokee.

LEAD AND ZINC.

Lead has not been found in quantities to justify operation elsewhere in the State, although its existence has been ascertained in several localities in the mountain region, as in McDowell and Cherokee. Both the silver and lead of North

Carolina are found, mostly in combination with sulphur in galena.

Zinc is not known to occur in the State, except in the above named association and localities.

COPPER.

Copper has been long known as an accompaniment of gold in most of the mines of that metal, especially in those which occur within the belt of granite bordering the slates on the west. Many of these, which were originally operated as gold mines, were abandoned on account of the increase of copper pyrites with the depth; and it is only within a few years that several of them have been reopened as copper mines. A considerable quantity of this ore has been exported, chiefly from the mines of Guilford. And as it is a well-established fact that copper veins improve downward, and as these veins abound in the gold region, and have recently been found also of a very promising character in Ashe county, and are known to extend in a well-marked belt of copper-bearing rocks through several of the western counties, and many promising mines have been recently opened in Jackson county, there is every probability that copper-mining will be developed into an important interest. The mountain region has been little explored, the geological survey having scarcely been carried beyond the Catawba, but it is undoubtedly one of the richest mineral sections of the State, as it is also one of the most interesting and attractive on account of its great agricultural capabilities, the salubrity of its climate, and the grandeur and variety of its scenery, containing as it does, the most elevated table-lands, and loftiest mountain ranges to be found in the Atlantic States.

TUNGSTEN.

Tungsten, a metal which was long merely a chemical curiosity, but has recently assumed a high value, particularly on account of its relation to the manufacture of steel, occurs in Cabarrus.

DIAMONDS.

Several valuable diamonds have been found in the trans-Catawba country, in Lincoln and Rutherford counties.

From this very rapid survey of the minerals of North Carolina, several facts worthy of note are evident: first, that, though widely distributed, they are not scattered at random, but follow a certain order of grouping and association; so that the probability of the occurrence of a given mineral in any particular locality can be approximately ascertained before examination.

Again, it is evident that this State is abundantly supplied with the more important and valuable minerals, those which are essential to the permanent and successful development of our agriculture and manufactures. Among these must be always first named iron, coal, and lime. Of the first two it has been seen that there is the greatest profusion. Of lime, however, it may be supposed that there is a deficiency. It is true that we have no such immense territory of limestone as is found in some of the other States; and yet, upon consideration, it will be apparent that nature has provided an abundant store for all possible needs. The tertiary region in the east finds an ample supply for the purposes of agriculture and architecture in its widely diffused beds of marl. And although the farmer of the middle and western sections may not always find an imperative need of this fertilizer, his soils being frequently derived by disintegration from rocks which contain a considerable percentage of lime, yet, since the breadth of the State is traversed at comparatively short intervals by a number of outcrops of limestone, which are crossed almost at right angles by our rivers and many of our rail roads, it is thus brought within convenient reach of almost every neighborhood. Nature has denied us only two of the more important mineral deposits, salt and gypsum, (and they may yet be discovered in the sandstone of the coal.) But of these two there is an unlimited store just across our borders, within easy reach by a short line of rail road, of our network of proposed and completed rail roads and of our rivers. Taking, then, in one view, our resources of iron, coal, and

lime, of gold and copper, and the great variety of other minerals of subordinate but real and increasing value, it is sufficiently apparent that our State has here the foundation of indefinite wealth and prosperity; and that there is wanting to these ends only a vigorous prosecution of our system of internal improvements on the part of our Legislature, and intelligence, industry and enterprise on that of our citizens.

Ordered to be Printed.

REPORT OF THE STATE GEOLOGIST.

STATE OF NORTH CAROLINA,
EXECUTIVE DEPARTMENT,
Raleigh, March 2d, 1869.

To the Honorable, the General Assembly of North Carolina :

GENTLEMEN :—I herewith transmit to the General Assembly a report of Professor W. C. Kerr, State Geologist.

I respectfully invite the attention of the General Assembly to this report and to the importance of encouraging a thorough Geological Survey of the State.

I have the honor to be,

With great respect,

Your obedient servant,

W. W. HOLDEN,

Governor.

REPORT OF THE PROGRESS OF THE GEOLOGICAL
SURVEY OF NORTH CAROLINA.

RALEIGH, February, 1868.

*To His Excellency, W. W. HOLDEN,
Governor of North Carolina :*

SIR :—I have the honor to submit the following additional report of the progress of the Geological Survey. This second report covers the operations of two years.

It was my expectation to be able to finish the preliminary examination of the western portion of the State during the past season ; but unavoidable interruption, delays from unfavorable weather and calls of the service to other points requiring immediate attention prevented the complete fulfilment of that expectation. There remains about two months' work to bring the survey of that region into complete and satisfactory connection with the work of my predecessor, which terminated in the tier of Counties lying in the line of King's and Pilot Mountain,—Gaston to Surry.

I have the honor to be

Your most obedient servant,

W. C. KERR,
State Geologist.

PREFACE.

In pursuance of the plan proposed and explained in the former report, my attention has been given mainly to the western section of the State. It is necessary, by way of re-statement of the reasons for this course, to say, that all the reports published by my predecessors are confined to the eastern and middle Counties. The whole labor of the survey hitherto having been expended on a part only of the State, to the entire exclusion of another part, constituting one fourth of its territory, there remained no room for hesitation in deciding where my labors should commence. And in the decision reached, the Executive and the supervisory board unanimously concurred. This iteration is made for the benefit of those who have failed to see, or to note, or to remember the former statement.

And there is a class of persons, whose number is not as small as it ought to be, who forget how gloriously large a State North Carolina is, larger than the Empire State of New York; over fifty thousand square miles of area, five hundred miles of length and the very respectable breadth of more than two and half degrees of latitude;—who forget, also, that in a very considerable part of this territory there is no steam, “to speak of,” and in much of it the roads are only *so-called*, and moreover, that, (however singular it may seem,) in this very same region there are several considerable hills.—some hundreds of them, much more than a mile high, which, while it is admitted that they add much to the interest and picturesque-ness of the scenery, (and I would by no means petition the Legislature to have them removed, or their shadows made less,) yet are not remarkable for the facilitation which they

give to travel and locomotion. Now it is precisely this portion of the State which has fallen to my lot to explore, and in the exploration of which I have travelled more than four thousand miles, chiefly in the saddle, and under the above-mentioned conditions, of much mountains, little roads and no steam. By way of apology to these inconsiderate people, who evidently suppose that ubiquity is an essential qualification of a State Geologist, I will add, that after the most strenuous efforts and a reasonable desire to be accommodating, I find it impossible to be in more than one place at a time.

By a reference to the former report, which contains my view of the work assigned me, and of the best mode of accomplishing it, it will be seen that it is no part of my plan to examine every man's farm in the State, nor even every farm which is "supposed to contain mineral," (and there are remarkably few which are not so "supposed.") Let it be considered that in this area of fifty thousand square miles there is much more than that number of farms, all equally entitled to attention and examination, according to this view. If nine months of the year were devoted to such examination, and two, or three farms were worked up each day, (which would be much too rapid procedure to satisfy the owners thereof,) it would require more than one hundred years to finish the job. "Life is short and art is long," particularly geological art, under these conditions.

So that it is apparent, upon the least consideration, that it is only possible to accomplish any thing of value to the public by some such plan as is sketched in the report above referred to: which is, in a word, (as to the geology,) to examine the rock-formations of the State in cross sections, to discover and indicate the leading geological features, to trace out and describe the mineral-bearing belts and to explore minutely only characteristic and important mineral districts and localities.

A leading object of the preliminary survey of the western portion of the State, in which I have been hitherto chiefly engaged, was to ascertain the existence, position, extent and rela-

tions of these mineral districts. And the broad facts thus ascertained, by myself, for the western, and by my predecessors, for the other portions of the State will direct the future operations of the survey, rather than the wishes, advice, or dictation of persons interested in particular "properties." But whenever important enterprises are contemplated, or projected for the developement of the resources of a region, I hold it to be quite in the line of my duty to assist, by my personal presence, if necessary and practicable. And for the benefit of those who wish specimens of ores, marls, mineral waters &c., examined, I will add that such samples may be sent by mail or express, and will be received and reported on, as heretofore, in the winter season; the summer being devoted entirely to field work.

But the less our people generally concern themselves about minerals and mining, the better for them. The mineral wealth of North Carolina has hitherto been a serious disadvantage. Her mines have been almost entirely used for purposes of speculation and gambling. There has been (almost) no systematic, scientific, and therefore profitable mining among us. Neither the science, nor the art of mining is taught in our schools, or colleges, or understood by any class of our people. They readily therefore fall a prey to imposters, ignoramuses and enthusiasts, who have already wrought incalculable mischief to the true interests of the State, particularly in the western Counties, by diverting the attention of our people from their proper employment and exciting vain and illusive hopes of realizing sudden and unearned fortunes. Many estates have been thus squandered, and lives wasted in the mad pursuit of phantoms, and much of the best energy of the country misdirected and thrown away. No one can travel through our western Counties without being made painfully aware of the prevalence and the origin of these delusions, amounting in some cases almost to lunacy.

Who, that has ever visited the western Counties, has failed to hear the oft-repeated story of lead and silver mines discovered and wrought by the Indians? There is scarcely a

County that does not boast one or more traditions of this sort. And it is surprising to observe with what credulity these stories are repeated, and how little variation the legend undergoes in changing its "local habitation" from County to County. *Now* it is on Table Rock; again on the slopes of the Black; at the head of Luftee; on Old Smoky; then at the foot of Hogback, on Toxaway:—the Indians used to return every year at a certain season from the west (and, as some affirm, and religiously believe, do still occasionally "re-visit the glimpses of the moon") for the ostensible purpose of honoring the graves of their fathers and chasing once more the deer, the wolf and the bear in their ancestral hunting grounds,—but really with the sole object of procuring lead and silver ore, which they have been seen to "pack" off to the great west! Again, some old hunter, (now dead, or moved west, or "wont tell") got all his lead for hunting purposes from a certain cove, on the side of a certain mountain, at the fork of a certain creek; or an old counterfeiter (now a fugitive, or in the penitentiary) used to coin silver quarters and halves (you can see them still in circulation!) from an ore gotten at a certain inaccessible locality, by a certain tree, on a certain stream; and every year, weeks and sometimes months are spent in searching for the magic spot. Occasionally the enthusiasm rises to the height of sending to the far west to fetch the "old hunter," or the ancient "red man." If he be alive, and can be found and can be persuaded by a handsome bonus, to return, the quest is renewed with redoubled ardor and hope. But, alas for the best-founded human expectations, after weeks of bush-beating, cliff-climbing and laborious search through "rocks, caves, lakes, fens, bogs, dens and shades of death," it turns out that the way-marks have been obliterated by time, bush and tree and stone and rill have changed their aspect, and nothing remains for it but that the old hero, in whom had centered so many hopes, must renew his exile without the honors which awaited him successful.

Less than a score of years ago, lead and silver traditions gave place to the wildest extravaganzas on the subject of *copper* mines. The whole mountain region was moved from its propriety, ordinary avocations were abandoned, every nook and corner, every rocky gorge and cliff and fastness of the mountains was explored for "copper blossoms," the wildest and ruggedest peaks were "shingled over a foot deep" with new entries, the County Surveyor was urged to his utmost exertion by extraordinary rewards, and the entry-taker became the most important officer in the country, and in some instances was so beset by the eager and impatient multitude that he was fain to betake himself to the upper story of the Court House, and from the safe elevation of the window transact with the crowd below, issuing entry-papers from "morn to noon, from noon to dewy eve,"—documents more precious than gold certificates, or Erie bonds. Mining was esteemed the only business worth a sane man's attention. Miners, Cornishmen and itinerant "minerologists" were in high repute and great request everywhere, and were followed and heard with eager ears like some magician whose lightest word could make or mar men's fortunes. Every cabin was a cabinet, and every man, woman and child a collector. The mountains were scarred all over with mines, and holes were blasted into the hardest rocks, if they happened to present "the indications."

This singular state of things continued for several years, and the amount of time, labor and money thus ridiculously expended is incredible; and the fanaticism has left its vestiges in the character, habits and language of the people, and is recognized in a distinct stratum of miners' slang in their vernacular,—*gossan*, (often "*goslings*,") *deposit*, *blow-up*, *lead*, *blossoms*, *mundic*, &c., being "familiar in their mouths as household words." And it is remarkably easy to renew the excitement in any part of this region, as was evidenced by the grand silver hunt last year in the Unaka and Beech mountains.

One of my most frequent and ungrateful tasks is to undeceive the victims of such impostures and delusions. A proper geological survey twenty years ago would have forestalled and prevented much of this mischief. And am I not right in saying that the minerals of this region, at least, have been an injury and a disadvantage thus far? And it must be remembered that the "copper-fever" was by no means confined to the mountain region.

That there are valuable mineral deposits in the western Counties is beyond question. Some of these have been indicated in the former report, and others will be duly noted in this. But it is palpably unwise and unprofitable to engage in a business of which one does not know even the alphabet. For every really valuable mine there are twenty that are utterly worthless; and yet to the uninitiated they are all alike El Dorados. To most, the bare fact of the presence of gold, silver, copper, is sufficient assurance of a fortune; since they are not aware that in a hundred veins, there may not be two, or even one, that *will pay*. This is a problem that only the intelligent mining engineer can solve, and he, only after ascertaining the size of the vein, its yield per ton of ore, the expense of mining it, and of eliminating the metal afterwards. These are matters of experiment and calculation, and should be intrusted only to an expert, just as one sends for a carpenter to build his house, or a surgeon to set a broken limb.

There seems to be a very general impression that there is some magic about the business, some mysterious open sesame, by which the secrets of the earth are unlocked. Indeed, my barometer tube is often supposed to be a mineral divining rod, and the question is sometimes gravely asked whether there is really any efficacy in the *forked stick*, which is still used by a class of vagabonds as a means of imposture.

It is also due to the prevalence of some such vague and indefinite, and erroneous notions of the character and office of geology, that I am frequently sent for to examine and report on a mine which has not been wrought for years; so that the shafts

and tunnels are fallen in, or filled with rubbish, or with water. It ought to be obvious to common sense, that no examination, experiment, or calculation can be made under such circumstances.

Such being the facts with regard to minerals and mining in our State, we are shut up and unavoidably impelled to the conclusion, which can hardly be too strongly stated, or too frequently and earnestly urged upon the public attention, that *agriculture* is the great and paramount economical interest of our State; with which, indeed, all other interests together are not to be mentioned in comparison.

In accordance with this view, I have given especial attention to whatever seemed likely to advance that interest. And I have considered nothing so important to the real and permanent improvement of the general agriculture of the State as the universal and liberal use of lime, and have therefore investigated and noted every locality within the range of my explorations which offered any indications of the presence of this mineral, and have every where urged its use. Hence also, on former occasions, I have called attention to the existence of a considerable bed of marl and limestone in the upper end of Wake County, on the line of the Rail Road. There ought to be a general arrangement with all Rail Road corporations in the State by which *lime*, if not all fertilizers, should be transported, at least from all quarries within the State, *at cost*. And they would find it to their interest to carry it *free*.

The recent very extensive introduction of phosphatic manures into the agriculture of Europe and America, and the increasing demand for these fertilizers among ourselves and the exorbitant prices at which they are sold, has led me to devote special attention to the question of the existence of native phosphates within our borders. Having learned from good authority that the black shales interbedded with the coal of Deep River had been analyzed by my predecessor, and that he reported a considerable percentage of phosphate of lime, I procured samples and had the analysis repeated by an eminent

Chemist of Charleston, South Carolina. The result, however, showed a very trifling amount of that ingredient.

And upon the discovery of the remarkable deposits of bone phosphates near Charleston, South Carolina, in the year eighteen hundred and sixty-seven, having examined those beds, I proceeded at once to explore the geologically similar formation in the eastern part of North Carolina, as represented by the marls, on the lower waters of Cape Fear, North East, Trent, Neuse and Tar rivers, having been led to expect the same deposit here, from several circumstances, but especially from the considerable amount of phosphate reported by Dr. Emmons in his analyses of the marls from that region. The result was, however, negative as before. I propose to make a more extended examination in the Spring, for according to all the general indications, it ought to be found here.

During the year eighteen hundred and sixty-seven, an examination was also made under Executive authority of the mineral and other resources of a portion of the Deep River and Cape Fear region, with a view to the location of a Penitentiary, and a report submitted thereon.

During last winter, at the earnest request of the trustees and faculty of the University, seconded by the Governor and Literary Board, a course of lectures, on Chemistry and Geology was delivered at Chapel Hill for the benefit of the senior class.

An excursion was also made, in the interest of geological science, to Montgomery County to collect specimens of the remarkable (supposed) fossil of Dr. Emmons, *Palaeotrochis*. These have been distributed among some of the most eminent palaeontologists of the country with the hope of reaching a solution of the question of their organic character, which has excited much interest among geologists.

The plan of the survey includes the collection, analysis and exhibition on the shelves of the museum of samples of the characteristic soils of every County in the State, together with the subjacent rock from which it was derived, and its subsoil.

As stated in the former report, there was no chemical laboratory connected with the survey, when I took charge of the work in the year eighteen hundred and sixty-six. I have collected by degrees, a small apparatus, sufficient for qualitative tests of ordinary ores, mineral waters, &c.; but for the quantitative analysis of a soil, or assay of an ore, the survey is still dependent on distant laboratories, outside of the State. By devoting to this purpose a few hundred dollars each year as heretofore from the current appropriation, an apparatus will be collected in a few years. But there is already a considerable accumulation of specimens of rock, ores, marls and soils, waiting analysis; and the number is constantly augmenting from every quarter of the State. The above mentioned plan of collecting from each County will add several hundred more. And there is an increasing demand among our farmers for analyses of soils, marls and other fertilizers; which is as it should be, since it is evident that our whole system of agriculture (if system it may be called) must be reformed and placed on a scientific basis. And the discovery of vast beds of the raw material for the manufacture of the most important fertilizer, in the adjoining State will speedily reduce the cost of superphosphates to one half the present rates, and increase the use of them manifoldly. This will render still more obvious the necessity of an inspectorship to protect our farmers from the enormous frauds to which they have been subjected during several years past, and from which there is no other adequate means of protection; which inspectorship should be attached to the chemical department of the survey. These facts show the importance of having a state laboratory at once. The hope of North Carolina is in her agriculture. There wants no argument to show this. Great as is her wealth in minerals, forests and waterpower, it is after all, to her soil (with the means of its indefinite improvement which exist in the marl and peat beds of the east, the lime quarries of the west and the salt and gypsum mines near her border,) that she must look for the restoration of her fallen fortunes, and for solid and permanent

prosperity. And chemistry is the foundation of all rational and successful agriculture.

A large collection has been made of minerals representing the sections of the rock-formations above described, and of ores from the various mines. These will be displayed in the geological room recently fitted up for the purpose as soon as the boxes of arms with which the building has been obstructed shall be removed. The importance of such a collection becomes every day more apparent. A very wide interest has been excited in the minerals of this State, and geologists, miners and capitalists from the Northern and Pacific States are continually passing, and they generally come first to the Capital for information, to get the geological reports and to see the collection of minerals. In the latter point, I have not been able to gratify them, for want of a cabinet room, although I have a very full representation of the mineral deposits and rock formations of the most inaccessible portions of the State, which these explorers seldom penetrate.

Inasmuch as there are no fossils in the western part of the State, very little has been done in the way of palaeontology. But hereafter my operations will include the fossiliferous marl and coal formations of the east, from which this department of the survey will soon receive ample illustration.

During the last two seasons, I have had the valuable aid, in the barometrical observations, of Captain W. Cain, Civil Engineer and Mr. Charles Curtis, of Hillsboro', to whom I was similarly indebted in my first campaign among the mountains. The former also rendered important service in the tedious work of computation.

I am also indebted for much timely help and furtherance to a number of the intelligent, hospitable and public spirited citizens of several Counties, to whom I hereby make my grateful acknowledgments.

CHAPTER I.

INTRODUCTORY.

The report of progress previously submitted, closed with a brief and incomplete account of the tier of Counties along the west side of the Blue Ridge, including the plateau of the French Broad.

The work was resumed here the next season, (one thousand eight hundred and sixty-seven,) and the preliminary survey, or reconnoissance completed for these Counties and advanced during that and the following year, (one thousand eight hundred and sixty-eight,) so as to include, as the entire territory explored during the two seasons, the following Counties, viz: Transylvania, Henderson, Buncombe, Madison, Yancey, Mitchell, Polk, Rutherford, McDowell, Watauga, Ashe, Alleghany, a part of Wilkes, Caldwell, Burke, Cleveland, Gaston, Lincoln and Catawba. The approach of winter prevented the completion of the district by adding Alexander, Yadkin and Surry.

It will be seen that the work progresses by parallel tiers of Counties, running from north-east to south-west, for reasons heretofore explained, and obviously connected with the leading geographical as well as geological features of the region. There appears through this portion of the State the same remarkable continuity and persistence of geological structure and mineralogical character, along the outcrop of the different formations that traverse the State, which was so conspicuous in the western Counties; so that along the line of the successive transverse sections, the principal and regulative formations are in general readily identified. And the same absence of anticlinals also, and entire independence of the direction of

the mountain chains upon the lines of outcrop, are observable.

The series of topographical and astronomical observations have been continued and extended over the larger part of this region. Its topography presents some singular and interesting features, which ought to have an important bearing upon the location of our works of internal improvement.

The elevations and angular positions were taken of the highest peaks and main spurs of the Smoky Mountains along the north-west border, from Paint Rock round to Big Bald in Yancey, as well as several summits in the Walnut range. These observations were connected with the bench marks of the Rail Road survey along the French Broad. A similar series of barometrical and sextant observations was carried along the crests of the Blue Ridge and Saluda chains, from the head-waters of French Broad in Transylvania, eastward and northward, including the Tryon range; the several massive spurs and peaks about Hickory Nut Gap, the heavy chain of the Swannanoa Mountains and the spurs of the Blue Ridge, lying eastward, in Rutherford and McDowell, on the head waters of Catawba river; thus connecting the elaborate survey of Prof. Guyot in the Balsam and Newfound Mountains with his observations in the region of the Black and Roan, and with a series made by myself in the year eighteen hundred and sixty-one, in the Linville and Table Rock ranges, and in the Blue Ridge and Yellow Mountains on the North Fork of the Catawba and on North and South Toe.

The chain of observations was resumed in the neighborhood of the Grandfather and carried northward to the State line on the waters of North Toe and Elk rivers, including the sinuosities of the Blue Ridge north of Humpback, the Sugar and Hanging Rock and Beech Mountain ranges; and from here north eastward both the parallel chains, the Blue Ridge and Smoky (or Iron Mountain, as it is here called,) together with the several lofty cross-chains and spurs, were worked up as far as the Peach Bottom range in the eastern part of Alle-

ghany. The triangulation was also extended so as to include the principal secondary ranges east of the Blue Ridge, as the Brushy and Warrior Mountains &c., in Caldwell and Wilkes, and the South Mountains in Burke, Cleaveland &c., and the King's Mountain range on the lower Catawba. The elevations were taken, not only of the summits, but also of nearly all the principal gaps of the Blue Ridge from Transylvania round to Alleghany, as well as of numerous points on the plateaus beyond, and on the eastern slopes also, so as to give, in outline at least, the grand topographical features of the country. The triangulation, and the determination of the latitude and longitude of a series of points were necessary to enable me to construct a geographical map of the State sufficiently accurate in its leading features for the purpose of locating intelligibly, the geological formations.

The absurdly erroneous and conjectural character of the existing maps of the State is more palpable in the mountain section than elsewhere. As illustrations may be mentioned the mislocation of the southern boundary of Haywood County by ten miles; the placing of the well known Tryon Mountain *on the Blue Ridge* eight or ten miles from its actual position, which is east of Green river, on a massive spur of the Saluda Mountains, which is entirely omitted, although higher and more conspicuous than the Blue Ridge itself; and the removal of King's Mountain from its ancient seat in Gaston County, three miles north of the State line, into a neighboring State. These maps are in fact but a jumble of errors, quite useless for any scientific purpose.

In constructing the outlines of a geological map of the State, it was of course necessary for me to know the latitude of our Southern boundary; which none of the maps profess to give. By agreement between the two Carolina colonies, and afterwards between the States, that line should have been the parallel of thirty-five degrees, north latitude. But in fact, as run by the Commissioners, first about the middle of the last century, and again in the year eighteen hundred and

thirteen, it consists of a very broken, irregular line, which is not coincident with a parallel of latitude at all, and varies many miles from that of thirty-five degrees, and on both sides of it. It appears by the records that Dr. Joseph Caldwell was appointed in the year eighteen hundred and thirteen to determine the latitude of the eastern and western extremities of that portion of the line which lies between the Catawba river and the mountains, and which was run for a due west line in the year seventeen hundred and seventy-two. His determination was only approximate, but he found the western end of it too far north by about seventeen miles, and the eastern end, at the confluence of the South Fork of the Catawba, by more than ten miles. The position of the other (supposed) east and west portion of the boundary, between the Catawba and Yadkin, has never been ascertained, so far as appears. I therefore took observations at the western end of it, in order to fix both its latitude and longitude. The line is laid down on most maps as running due east from this point, but will of course be found seriously out of course, for the same reason as the other, the variation of the compass having been but little understood at the time it was run. The tree marks of the survey having disappeared, and generally the trees themselves, the actual position of the line at any point is mere matter of tradition, and cannot be ascertained, because it is not known what the variation of the compass was at that time, nor what correction, if any, was made for it.

Our northern boundary is in no better condition, particularly the western half of it. Most of the maps show an error of nearly two miles, (to the disadvantage of this State, as usual,) due no doubt to the same cause as in the other cases.

This indeterminateness of our boundaries is the occasion of frequent controversies, and a fruitful source of vexatious litigation, and ought to be removed by having these lines scientifically and authoritatively located and marked with stone posts at intervals not greater than five miles.

CHAPTER II.

GEOLOGICAL.

Topographical Geology.—The territory covered by the explorations of the past two seasons, consisting of the Counties above named and extending across the breadth of the State, and from the French Broad to the lower Catawba, lies along the drainage or river axis of the State, the general direction of which may be represented by a line extending from the southeast corner of Henderson County to the northwest corner of Ashe, its track being indicated by the peaks of Sugarloaf, High Pinnacle, Grandfather, Flat Top, Elk Knob and White Top. In passing northward along this line, it will be seen to make a sweep first towards the west, reaching its greatest divergence at the point where the lofty spur of the Black is thrown off, and then recurving to the right, attaining its greatest eastern deflection at Flat Top, near the point where the Blue Ridge meets the cross chain of the Rich Mountain. This is the *dévide*, or watershed of the State, all streams on one side flowing westward, and on the other, eastward. But since the waters of New River, after impinging against the Blue Ridge, are deflected, and thrown back ultimately upon the western slope, in Virginia, it will simplify our conceptions to regard the Blue Ridge as the dividing line; which, it will be seen, separates the area under remark into two plateaus which are broadly contrasted with each other. The one is narrow, the average breadth not exceeding twenty-five miles; and very elevated, rising from a height of two thousand feet in Henderson to nearly four thousand on the borders of Mitchell and Watauga, and descending again gradually to a little less than three thousand, on the Virginia line; and

has a gentle slope towards the northwest, but breaks off abruptly on its eastern edge with a sudden and precipitous descent of more than one thousand feet. The other, which may be called the piedmont section of the State, is a broad, corrugated plateau, descending from a height of one thousand five hundred feet along its western edge at the foot of the Blue Ridge, with a gradual slope, to about one thousand feet on the east, and having an average breadth of about fifty miles.

For a general description of the western plateau I must refer to the former report, (pages twenty-five to thirty.) It is divided transversely by several very high cross chains into as many basins, or troughs. In the middle of it the two great parallel ranges, the Blue Ridge and the Smoky, (or Iron Mountain,) make the nearest approach to each other, and although they are here more nearly balanced than further west, the latter still holds the predominance and is yet traversed, as before, by all the westward flowing rivers, which take their rise in the lower chain of the Blue Ridge. And at this narrowest part, the plateau reaches its greatest elevation, in an area of more than one hundred square miles, whose altitude ranges from three thousand five hundred to four thousand feet. This is the highest plateau of the same extent to be found east of the Rocky Mountains. In the center of it rises conspicuously the symmetrical forest-crowned summit of the Sugar Mountain, from the sides of which four rivers take their rise, North Toe, Elk, Watauga and Linville; and on its margin rises the rugged form of the Grandfather, the highest summit of the whole Blue Ridge.

These mountains, plateaus and valleys owe their existence and all the details of their form and position to the action of water, the basins above described being, like those further west, without exception, *valleys of erosion*, having, in no case, an anticlinal, or synclinal origin, being in fact wholly independent of geological structure.

The Blue Ridge is throughout its whole course in this State

the divide, or watershed, but it has besides the additional peculiarity that it constitutes the eastern margin of the great table land. Here however, in the highest and narrowest part of the table land, this characteristic fails, the upper valley of Linville between the falls and source, being truly a part of transmontane plateau; the Blue Ridge being only a range of hills, fringing the western edge of this valley, which hills are separated by gaps, many of which are not two hundred feet above the river. So that it is, so to speak, only an accident that these waters did not break through what is now the Blue Ridge, instead of the higher range of Jonas' Ridge.

At one other point alone there is a repetition of this peculiarity, viz: in the case of Casher's valley in Jackson County.

The eastern or piedmont plateau is divided, as to its river systems, into three regions, drained respectively by the Broad, Catawba and Yadkin rivers; the slope of the first being towards the southeast, and of the others east and a little north. These drainage surfaces are separated by two nearly parallel easterly chains of mountains, the South and the Brushy. The former is a spur of the Blue Ridge, and may be regarded as an eastern prolongation of the Swannanoa range, in Buncombe. It is the divide between the Catawba and Broad rivers, and attains a height of thirty-five hundred to four thousand feet in several points along its course of twelve or fifteen miles to the mouth of Crooked creek, where it rises into a precipitous mural ledge, three or four miles in length and three thousand three hundred feet in height.

From this point eastward for above twenty miles, it is a low straggling ridge, constituting the divide between the waters of the Catawba and Second Broad, scarcely reaching at any point an elevation of two thousand feet. But between the head waters of Silver Creek and First Broad it suddenly rises, in the South Mountains proper, to a little over three thousand feet, which elevation it preserves with remarkable uniformity through its numerous peaks, as well along the massive spur, (Deal's Knob, &c.,) which it sends off northeastward between

the waters of the Catawba and South Fork, as throughout the main chain for a distance of fifteen miles to Ben's Knob; beyond which it is prolonged three or four miles in a high, narrow, regular ridge of about two thousand five hundred feet, called Queen's Mountain.

From this massive portion of the range, especially from the western end of it, several spurs make off southward between the waters of First and Second Broad, the chief of which are the Bickerstaff and Lookadoo Mountains, which are, in several points, nearly as high as the main chain.

The other range, the Brushy, is an independent chain which divides, for most part of its course, the waters of the Catawba and Yadkin, from a point a few miles north of Lenoir, for more than fifty miles, in a direction a little north of east. This chain also preserves through the greater part of its length a remarkable uniformity, in direction and elevation, many of its peaks rising above two thousand feet. The Pilot is properly a continuation of this chain beyond the Yadkin, which breaks through it at this point.

Besides these two principal chains, the western side of the plateau is diversified by many spurs of the Blue Ridge of great elevation, being in many cases much higher than the Blue Ridge itself. Among these may be mentioned the Saluda Mountain, on our southern border, which constitutes the State line for a distance of more than twenty-five miles; the Tryon and White Oak range in Polk County, a spur of the Saluda; the Hungry Mountains; the huge pyramidal masses about Hickory Nut Gap, as Sugarloaf, Bear Wallow, Pisgah, Pinnacle; the high ranges on the north side of the upper Catawba, upon which are the conspicuous summits of Mackey's Mountain and Wood's Knob; and most notably, the long, regular and massive southerly chains of Linville and Jonas' Ridge. These last are parallel and approximate, more than twenty miles long, and separated by the deep narrow gorge of Linville river.

The belt of country east of this, between the Blue Ridge and

the Yadkin, having a breadth of fifteen or twenty miles, is corrugated by numerous southerly ridges making out from the Blue Ridge between the tributaries of Catawba and Yadkin, many of them more than twenty-five hundred feet high.

I have not undertaken in these preliminary reports to give numerical or detailed reports of observations, topographical, geological or agricultural, these being reserved, for obvious reasons, until the final report on the geology of Western North Carolina, after the computation of observations, the analysis of specimens, and the construction of the geological map and sections. But as there are some circumstances which give a present interest to the topography of the Blue Ridge section, I will give below the results of a series of observations made along that line. Most of these observations were taken with the barometer; a few of them have been obtained from Rail Road surveys. Beginning on the head waters of French Broad in Transylvania, the following are the elevations of successive points along the line of the Ridge, proceeding northward. The calculations were abbreviated, for want of time, and they are, therefore, only approximate, giving the elevations within a few feet:

Cantrell's Mountain,—Blue Ridge,	3,550
Grassy Folly Gap, " "	2,823
Slicken " " "	2,868
Jones' " " "	2,920
Cæsar's Head, spur to south of Blue Ridge,	3,218
Chestnut Mountain, " "	3,323
Green River Gap, " "	2,722
Pinnacle, " "	3,667
Coley, " "	3,751
French Broad, near Brevard,	2,105
" " at mouth of Little river,	2,083
Butt Gap, (Rail Road,)—Blue Ridge,	2,169
Hendersonville, (Brittain's,)	2,162
Saluda Gap, (Rail Road,)—Saluda Mountains,	2,340

Corbin Mountain,—Saluda Mountains,	2,972
Howard Gap,—Tryon Range,	1,879
Tryon Mountain,	3,232
Pacolet River crossing,—Howard Gap Road,	944
Green “ “ “ “ 	1,616
Gap of Blue Ridge, “ “ “ 	2,168
Hungry Mountains, highest point,	3,061
Reedy Patch Gap,—Blue Ridge,	2,236
Hickory Nut Gap, “ “ 	2,906
Broad river, at mouth of Reedy Patch creek,	1,488
Stone Mountain,	3,437
Sugarloaf, spur of Blue Ridge,	3,995
Bear Wallow, “ “ 	4,255
Pisgah, “ “ 	4,432
The Pinnacle, or Bald,	3,861
Cane Creek Gap,—Blue Ridge,	2,959
Black Knob, “ “ 	4,277
Lytle's Peak, “ “ 	4,385
Dill's Knob, per Level,	3,818
Swannanoa Gap, (Rail Road,)—Blue Ridge,	2,658
Hickory Nut Mountain, near mouth of Crooked Creek,	3,312
Old Fort, Mill creek, (Rail Road,)	1,452
Carson's, Buck Creek, (Col. Whiting,)	1,254
Buck Creek Gap,—Blue Ridge,	3,387
The Narrows, “ “ 	4,058
Three Knobs, per Level,—Blue Ridge,	4,100
Gillespie Gap, “ “ 	2,778
Wm. English's School House, head of North Cove,	2,023
Humpback Mountain, highest point,—Blue Ridge,	4,395
Rattlesnake Spring Gap, near Linville Falls,	3,325
Gap at head of North Fork of Catawba,	3,405
“ “ Brushy creek, (Prof. Guyot,) Blue Ridge,	3,425
Pisgah Gap,—Blue Ridge,	3,423
Soapstone Gap, “ “ 	3,588
Dellinger's Gap, “ “ 	3,600
Miller's “ “ “ (Col. Gardner,)	3,733

Sugar Mountain, Blue Ridge,	5,312
McCanless' Gap, " "	4,198
Grandfather Gap, (Guyot,) between head waters of Watauga and Linville,—Blue Ridge,	4,100
Grandfather, (Guyot,)—Blue Ridge,	5,897
Flat Top, head waters of New River, near Blue Ridge,	4,549
Watauga Gap, (Rail Road,)—Blue Ridge,	3,779
Big Ridge, " "	4,100
Three Forks, New River,	3,069
Boone Court House,	3,250
Howard Gap, Rich Mountains,	3,688
Rocky Mountain, spur of Blue Ridge,	4,071
Cooke's Gap, (Montgomery,) Blue Ridge,	3,307
Bent Branch Gap, " "	3,146
Lookout " " "	3,210
Clear Branch " " "	3,193
Deep " " "	3,105
Thompkin's Knob, " "	4,064
Jefferson, Ashe County,	3,087
South Fork of New River, (mouth of Cranberry,)	2,707
Grandfather, Alleghany County,—Blue Ridge,	3,987
Ferny Knob, Peach Bottom Mountains, highest point, ..	4,291

It is thus seen that the lowest portion of the Blue Ridge lies along the eastern border of Henderson County, from Butt Gap to Reedy Patch. In fact, through this distance of about twenty miles, there is no Blue Ridge, so that there is no difficulty in turning the waters of the plateau from their westerly flow and bringing them into the eastern rivers, as has been done by the inhabitants for milling purposes. And one may pass the Ridge in many places without being aware of the fact, and he can only realize it by observing the change in the direction of the streams. This is especially true of Reedy Patch Gap, which as appears from the above figures is lower than the town of Asheville. It is for the engineers to explain why the main trunk of the Rail Road system of the State was carried through

a Gap more than four hundred feet higher and greatly more difficult of access from both sides.

The topographical features of this mountain region of the State thus briefly sketched, are not accidental. There can be no doubt that here was once a lofty plateau higher than the highest summit of the Black, and comparable in elevation, if not in extent, to the present great table land on the western side of the continent, between the Rocky Mountains and the Sierra Nevada. The destructive action of atmospheric agents, chemical and mechanical—water, frost, oxygen, carbonic acid, have by their incessant play through the uncounted centuries which make the lifetime of a continent, disintegrated and worn away the vast mass, until it is but a skeleton of what it was, transporting the ruins successively to lower levels, and finally to the sea. Of course in this process the softer rocks, as the shales, limestones and certain micaceous slates, would suffer a greater amount of abrasion than the harder masses, such as granite and the silicious and hornblendic slates and gneiss. Hence the present mountain chains are composed of the latter, while the rivers have scooped out their valleys through the tracts occupied by the former. There are abundant illustrations of these statements throughout this interesting region. It will be sufficient to cite the great valley of Cherokee, hewn out of the limestone, and following that formation closely, far down into Georgia; the valley of the French Broad through Transylvania and Henderson, which has been excavated in a similar and easily disintegrable rock; and the valleys of Catawba and Yadkin. It has been elsewhere observed that the rivers usually take a course at right angles to the direction of the Blue Ridge, for the obvious reason that that is the line of quickest descent. But these two last named rivers form an exception to the rule, striking off for fifty or sixty miles in a northeasterly course, nearly parallel with the Blue Ridge, taking the tract of the softer rocks and making a grand easterly sweep around the harder strata of the Brushy and South Mountains.

These general features of the region are not without interest in a scientific point of view, but they are of practical importance also, on account of their intimate connection with climate and agriculture and an obvious and most essential relation to the system of internal improvements, upon which the future growth, developement and prosperity of the State so largely depend.

SURFACE GEOLOGY.

As the forms of the land surface, (the topography) have their origin in geological causes, so the nature and condition of the materials which constitute that surface, are referrible to the same agencies. And as the reliefs and contour enter as a prime factor into the production of climate and thus claim the interest and study of the agriculturist, so the superficial geology, on account of its intimate and obvious connection with the origin of soils, demands his attention also. These considerations are independent of, and additional to the scientific interest of the subject.

The present condition of the earth's surface at any point is due in large part to the causes last in action upon it. These are chiefly meteorological. Since the continent received its present general "form and pressure," its surface has been subject to the incessant action of these agencies, and has undergone profound alteration. Earth, (as contradistinguished from rock,) soil, that part of our globe in which man is chiefly interested as being a "tiller of the ground," is the direct result of the action of these forces upon the subjacent rock-formations. In the section of the State under consideration, the surface consists either of the original rock, or of earth derived from it by disintegration in situ, or of the debris of it transported, sorted and variously arranged under the action of moving water and ice. Of the first description very little exists, and that only on the tops of a few high mountains, or rocky ledges, as the Grandfather, Table Rock &c., or an occa-

sional precipitous gorge or cliff, as Shortoff and Linville. The aggregate of rock surface is quite insignificant, the mountains being generally covered to their very summits and along their steepest escarpments with soil and forests.

To the second class belongs nearly the whole surface of this region. The soil, subsoil and earth are simply the weathered remains of the underlying rocks, which have been decomposed to a variable depth of a few feet, to several fathoms, according to their character and permeability to water and air.

To the third class belong only the valleys, (or bottoms,) of the streams, and in a few cases, the lower ranges of hills that front, or project into them. These bottoms consist of sediments, gravel, sand and clay, (alluvial.) The deposits on the hills and ridges are drift, and consist of earth, pebbles and boulders, often intermixed with fine clay. Both consist of the debris of rocks found on the higher ridges, mountains and plateaus, and can often be traced to their sources, though several miles distant.

The alluvions present nearly level surfaces, are of various depths, from a few inches to several feet, and are, in some cases, of considerable extent, as in the valleys of several of the larger rivers, where are frequently found continuous tracts of several thousand acres. These are not always in one plane, but are frequently disposed in terraces rising by regular and well defined steps, or benches, one above another, and presenting steep escarpments towards the river. The larger part of the "bottoms" usually belongs to the first or second terrace; the former being still subject to occasional overflow, the latter very rarely, or (in most cases) never, being generally from five to fifteen feet higher. The third has generally an elevation of forty to fifty feet above the present water level, and the fourth from one hundred to one hundred and fifty. These two, and especially the last, are not of very frequent occurrence, and are of small extent, and often reduced to a few isolated patches. Examples of two terraces are found on all the larger streams, and of three and four on several of the larger rivers, as, for

example, the French Broad, at and below Warm Springs, and the Yadkin a little below Patterson. Gravel and boulders, as well as sand are frequently found in these benches, which may be regarded as having, in many cases at least, the same origin as the drift, which caps and faces the terminal ridges and knobs which project into the valleys, and is found at various elevations along the upper reaches of most of the large rivers, on both sides of the Blue Ridge. A very notable example may be seen in the town of Asheville, (as formerly mentioned,) in the pebble beds which crown the summit of the hill overlooking the town on the west, and which must be about three hundred feet above the present bed of the river. Near the base of the higher and steeper mountain ranges, the material of the drift is very heterogeneous, consisting of earth and sand and rounded and smoothed fragments of the various kinds of rocks found on the higher parts of the mountains. But as the valleys open out and the foot-hills recede from the higher chains, it consist mainly, of pebbles and boulders of quartz (and a few other hard rocks) imbedded in sand or clay, the latter often very fine and tenacious. A very good example may be seen in Catawba valley less than one mile below Old Fort, in a cut of the Rail Road, from which have been taken an immense number of very hard and smooth quartz boulders, some of them weighing above a ton.

Occasionally there are two or three beds of drift superposed, one upon another unconformably, consisting of different materials evidently derived from different sources, the upper occupying the depressions and conforming to the irregularities of the lower.

In a few instances drift beds are found with a distinct beach structure, as on Pacolet river, (in Polk County near Columbus,) at an elevation of not less than one hundred and fifty feet above the present water level.

These drift beds are frequently auriferous, as in California and other parts of the world. Indeed, the most extensive deposits of this character in the State are the famous placers of

the South Mountains, (Brindletown, Brackettown &c.) occupying a portion of the four contiguous Counties, Burke, McDowell, Cleaveland and Rutherford. The spurs and lower slopes of the mountains on both sides and the numerous river and creek bottoms are mostly covered with a diluvial deposit of varying depth up to fifteen or twenty feet. These materials have evidently been brought down from higher levels, and are composed of the ruins of various gneissoid rocks. The deposit occupies interruptedly an area of nearly two hundred square miles.

GENERAL GEOLOGY.

The rock formations of this region belong to the same general description as those which occupy the more western Counties, and were described in the previous report. They are commonly known as Primary and belong to the most ancient of the geologic series, called Azoic, Metamorphic &c., and are granitoid, gneissic and schistose in character. These rocks are likewise much disturbed in position, dipping at a high angle, generally towards the south-east, the average about sixty degrees as before, and the strike is also about the same as for the more western series, viz: about north fifty degrees east. To this there are very many local exceptions. The variations and irregularities are most notable in what I have termed the axial zone, which is included in the more elevated of the two plateaus above described, and includes the town of Asheville, the Black Mountain, the Yellow Mountains &c. At many points in this zone the dip is reversed over considerable areas, and the strike is also frequently so variable as to be reducible to no law.

Beginning in Madison County, on the Lower French Broad, it will probably be the simplest and most intelligible mode of procedure, to characterize in succession the different formations as they present themselves in section from northwest to southeast.

At Paint Rock, on the State line, occur the thin-bedded silicious slates which were described in the former report. They are called by Prof. Safford, the Geologist of the State of Tennessee, Chilhowie Sandstones, and are set down conjecturally by several eminent geologists as Potsdam Sandstone. They have never yielded any fossils, by which their geological horizon might be determined. A few very thin beds of argillaceous slate are found interpolated here and there between the quartzose strata.

Passing up the deep gorge which the river has excavated, the quartzites are soon found to be interbedded with, and are finally replaced by shales and grits, the latter generally fine, but occasionally approaching in appearance a breccia, or conglomerate. These are succeeded by heavy beds of argillaceous slates and shales, which in turn give place, at Warm Springs, to a heavy-bedded blue and grey limestone. This is followed by a calcareous, compact, fine-grained sandstone, which presently passes into a grey, much-jointed quartzite rising in vertical cliffs along the river for two miles, and succeeded by a well characterized coarse conglomerate with bluish-grey slates and shales, at and below the mouth of Laurel river. A little above this point comes in a very extensive and conspicuous bed of felspathic quartzite, or petrosilex, which continues for more than a mile, and then graduates through a gneissoid rock into a series of grey, drab and mottled argillaceous slates and shales. This succession of quartzites, grits, shales, limestone and conglomerate occupies in direct cross-section a space of more than ten miles. I have elsewhere referred to the identity of this formation with that which is so conspicuous on Valley River, and shall therefore call it the *Cherokee Slates*. They pass in a northeast course up the Laurel valley and through the Smoky, or Unaka Mountains into Tennessee.

The next formation in order, coming east, is the great "axial belt," as I have elsewhere designated it, of gneissoid rocks. It occupies the central and highest part of the great mountain plateau, beginning on the upper waters of Hiwas-

see river in Clay County, and extending in a direction about north fifty degrees east, quite across the State to Ashe County. It is limited on the southeast by a line nearly coincident with the Blue Ridge, except where that range makes a southeastern sweep around the Counties of Henderson and Transylvania, being succeeded by the slate and limestone series of those Counties. The average breadth of the formation is about twenty-five miles, and since it is conspicuously developed across the whole breadth of Buncombe County, and may be seen in complete section along the French Broad in its course through that County, it will be more in accordance with usage to call it the *Buncombe Group*. The rocks of this belt, as has been elsewhere stated manifest an extreme degree of alteration, and of disturbance. They belong to the general description of granitoid or gneissic rocks, and consist of various and recurrent successions of gneissoid slates,—quartzose, felspathic, micaceous and hornblendic, with frequent beds of gneiss proper, and occasional interpolations of true granite. A large body of reddish porphyroidal felspathic gneiss is found along the northwestern edge of the belt, as may be seen a little below Marshall on the French Broad and again in Yancey, some four miles north of Burnsville. Mica schist also occurs in large development, towards the eastern margin of the belt, as may be seen in the town of Asheville, and along the Swannanoa valley to a point near the gap. This rock is generally garnetiferous, and frequently also abounds in crystals of kyanite, as may be seen two miles west of Swannanoa Gap, and on the waters of South Toe river a few miles east of Burnsville. The formation is also characterized throughout its whole extent by the frequent occurrence of isolated masses of magnesian rocks, ophiolites, serpentines, soapstones, talcose and chloritic slates, with tremolite, asbestos and actinolite rocks. These are generally associated with hornblende slate and syenite, and usually contain veins of chromic iron. Examples may be seen on Ivy (on the road leading from Asheville to Burnsville); six miles north of the latter place; and

again on South Toe eight or ten miles east of the same point ; on the Bakersville road, a few miles south of that place ; in the Rich Mountains, (head waters of Howard's Creek) in the north part of Watanga ; and in the southern part of Ashe on Elk creek.

Hornblende slates are found in largest development in the Yellow and Iron Mountains in the northern part of Mitchell County, and again in Watauga and Ashe Counties between Watauga river and the North Fork of New River. This last is the most extensive bed of this rock in the State and forms for twenty miles a succession of very high and rugged mountains. In the Big Rich Mountain and Elk Knob these slates are highly garnetiferous.

The Buncombe Group is divided transversely on the borders of Mitchell and Watauga by what appears to be a fold of the Cherokee Slates, (or their associates and representatives,) which laps around the base of the Yellow Mountains and meets the Blue Ridge and the Linville Slates on the head waters of Linville river, between Humpback and Grandfather, thus establishing, if this observation be correct, the identity of the Cherokee and Linville series. Here I am inclined to place the fine grained, light colored and greenish talco-quartzose conglomerate slates on Elk river and upper Watauga, and the light colored and greenish felspathic and quartzose sandstones and grits of Sugar Mountain and the upper valley of Linville and Elk, and the large body of dark grey and bluish compact quartzo-argillaceous epidotic slates and epidiosites which extend from the upper valley of Linville across Elk river, through the Peak and Hanging Rock Mountains, in a north-east course to main Watauga, where they appear in precipitous rugged cliffs along the turnpike, for more than a mile in transverse section. These last (the epidotic slates) are often trappean in aspect, and are generally streaked and penetrated very irregularly with epidote, which is frequently found in small nodular roundish masses, giving the rock an amygdaloidal appearance. Intermingled with these there is frequently a multitude of sphe-

roidal granules of calc-spar, and occasionally small cavities partly filled with epidote and gypsum. The rock is also in many places, penetrated by a multitude of minute quartz veins. A similar formation exists in Canada.

The Buncombe Group is limited south-eastward, as has been already indicated, by the Linville Slates which pass from the Forks of Toxaway, near the State line, in the south-west corner of Transylvania, down the north side of the valley of the French Broad in that County, crossing the river at the mouth of Cane Creek, and so up the valley of that creek and through the Blue Ridge across the upper valley of Catawba to Linville Mountain. This formation has, beyond the Blue Ridge, a breadth of two to three miles and consists there of ash colored and bluish slates and shales and limestone with occasional outcrops of thin-bedded light colored sandstone, or quartzite. On the Catawba the limestone seems to be represented by a greenish calcareous slate half a mile above the mouth of Buck Creek. Linville Mountain consists almost exclusively of sandstone and quartzitic slates, in places very thin-bedded and flexible, (itacolumite) and in a few places interbedded with thin layers of a greenish shaly slate. Limestone crops out along the western base of the mountain at various points from Turkey Cove to the head of North Fork, a distance of nearly twenty miles. The quartzites of Linville Mountain are much disturbed in position, particularly on the west, and the prevalent dip seems to be *west*. The rock also exhibits the jointed structure here very notably. Passing eastward, this series appears in the whetstone slates of Adam's Knob on John's River, in the blue slates and light colored quartzites on the Yadkin near Patterson, and so sweeps in a north-east course along the east flank of the Blue Ridge, and often includes it, as at Blowing Rock Gap, and the Grandfather Mountain in Alleghany. In this formation, east of the Blue Ridge, there are frequent interpolations of rocks having a gneissoid aspect, as in the light colored coarse grained ledge at the foot of Table Rock and many other points east of that, and again in the appa

rently very coarse porphyroidal gneiss one mile south of Blowing Rock on the turnpike. This last is in fact a dark greenish grey argillaceous schist which encloses between its layers rounded and somewhat flattened nodules of cleavable felspar, which are arranged in a general parallelism with the stratification. These ovoidal masses are frequently from three quarters to one inch in diameter.

The Linville Slates are succeeded by a second series of metamorphic gnessoid rocks, which are essentially a repetition of the Buncombe Group. This fourth formation covers a larger area than any of the others, about as large, in fact, as the other three together, and extends eastward to the King's Mountain Slates, being limited in that direction by a line connecting that mountain with the Pilot, in Surry County; occupying therefore nearly the whole of the piedmont plateau.

It may therefore be appropriately named the Piedmont Group, although it extends across the Blue Ridge into Henderson and Transylvania. Like the similar formation further west, it consists of a succession of felspathic, hornblendic and micaceous slates and gneiss. The most conspicuous of these subdivisions is the broad belt of light colored and grey felspathic gneiss, sometimes fine, generally coarse grained and porphyroidal, which extends along the western side of the formation from the upper French Broad to the Catawba in Burke. This may be seen at the falls of Little River, at the crossing of the French Broad, in the quarries near Hendersonville, in the naked ledges at Flat Rock, in the mural precipices about Hickory Nut Gap, in the steep and narrow ledge of Hickory Nut Mountain on Crooked Creek, and in the Rail Road cuts from Marion to Muddy Creek.

Along the eastern margin of this belt is a notable body of hornblendic slates, which crop out along the Blue Ridge at the head of Little River and at Flat Rock Gap, re-appearing near the head of Pacolet and attaining their greatest development in the massive range of Tryon Mountain and in Stone

Mountain on Reedy Patch Creek, and the Pinnacle in the angle of Broad River. They show themselves at many points beyond this, conspicuously on the head waters of Second Broad, in the western ascent of Deal's Knob in the South Mountain, and at the mouth of Muddy Creek, and so pass beyond the Catawba into the Warrior Mountains of Caldwell County.

The central and eastern portion of the piedmont section are occupied chiefly by various alternations of felspathic slates and gneiss. These may be seen in large extent in Cleveland and Rutherford on First and Second Broad, where they are much disturbed and very irregular in their bedding, and are highly impregnated with iron pyrites.

The middle, southern and eastern portion of Polk County and the southwestern angle of Cleveland are occupied by mica schists, which are usually garnetiferous and frequently pyritiferous. A similar large body of rocks is found in the eastern part of Burke County and extends over a large breadth of country, from the eastern end of the South Mountains several miles into Lincoln, and northward and eastward into Caldwell and Catawba. It is very observable in the Rail Road cuts between Morganton and Hickory Station, and between the latter point and Lenoir. These schists are occasionally talcose.

A second belt of hornblendic rocks,—syenitic, gneissic and slaty—occurs near the eastern side of this piedmont plateau. The town of Newton is situated in the midst of it; and from this point it extends southwest through Lincoln County, some five miles west of the town, occupying a breadth of one to three miles.

Serpentine occurs in Caldwell and Wilkes, at several points along the valley of the Yadkin and on John's River.

A notable feature in the geology of the whole western section of the State is the infrequency of trap dikes, notwithstanding the metamorphism and the very disturbed condition of the rocks. Two or three (of diorite) may be seen between the Catawba river and Morganton, one near John's River in

Caldwell, one (trachyte, large) on Swannanoa, and one (small, granitic) near the mouth of Reedy Patch Creek, near Hickory Nut Gap.

The King's Mountain Slates, which limit the Piedmont Group eastward, form a narrow belt of argillaceous, micaceous, talcose and quartzose slates accompanied in many places by limestone, magnetic iron and graphite. The direction of the outcrop of these slates is indicated by King's Mountain, Anderson and Pilot, which lie along the line of it, the latter a little westward. The dip of this formation is, exceptionally westward, although at a very high angle.

Thus it appears that geologically the western portion of the State consists of four groups, or formations; First, the Cherokee Slates along the Smoky Mountains on the northwest border, consisting of clay—slates and shales, sandstones, grits, conglomerates and limestone; Second, the Buncombe Group, occupying the larger part of the great transmontane plateau, between the Blue Ridge and Smoky, and consisting of gneissic and granitoid rocks; Third, the Linville Slates, a narrow belt stretching for the most part along the Blue Ridge and composed, like the first group of semimetamorphic argillaceous slates and shales, sandstones, limestone and gneissoid grits; Fourth, the Piedmont Group, gneissic and granitoid. It will be observed that these four groups constitute two recurrences of the same rocks, in the same order; the first and third being comparatively narrow belts of semimetamorphic slates, the second and fourth very extensive formations of highly metamorphic gneissoid rocks having in each case porphyroidal felspathic gneiss on the west, succeeded by hornblende slates, gneissic slates and mica schists. These relationships naturally recall the Rogers theory of reduplication by foldings and overturns on a grand scale, as in Pennsylvania.

ECONOMICAL GEOLOGY.

Each of the formations above described contains metalliferous deposits as well as other valuable minerals. The western, or Cherokee Group carries the most extensive iron beds, together with some valuable gold placers and veins; but these are confined to that portion of the series which lies further west and has been described in the previous report; within the area now under consideration, it contains silver, a few iron beds, limestone, barytes and buhrstone.

The Buncombe Group is distinctively the copper-bearing series, but contains besides, some of the most extensive and valuable iron beds in the State, gold, chromic iron, mica, serpentine and limestone. The Linville Slates are principally notable for their valuable limestone quarries, although they have yielded some gold, (as heretofore stated, in Transylvania,) and contain a few beds of iron ore, and abundance of whetstone (and probably grindstone) rocks. The Piedmont Group contains the most important deposits of gold, some iron, graphite and serpentine, with much copper and alum-producing pyritous slates, and mineral springs.

The localities of the most important of these minerals will be indicated, and the chief circumstances of their occurrence noted.

GOLD.

The only points west of the Blue Ridge, (within the limits now under remark,) where gold has been obtained are on the French Broad and New River. There have been found indications of gold in small quantities along the valley of Cane Creek in Buncombe, and on Boylston in Transylvania, as previously mentioned, but no deposits, or veins of much importance have been discovered. The other locality is on Howard's Creek in Watanga County, about one mile from Boon, where a small deposit of drift gold was wrought some years

ago. There is no evidence of any extensive occurrence of gold bearing rocks here.

In the Piedmont section there are three gold placers of considerable note. One of these is at Sandy Plains in Polk County. The gold is found in the "gravel" from the debris of denuded hills of mica schist. This gravel is found in the beds of several small streams over an area of several miles. These "diggings" are still wrought in a small way. No veins have been discovered.

The most extensive and notable deposit in this region and in the State is found in the South Mountains on the head waters of First and Second Broad and of Silver and Muddy Creeks. It is divided into four principal districts, on the above mentioned streams which are named respectively Whiteside, Jeantown, Brindletown and Brackettown. The whole area occupied (interruptedly) by this deposit is between one and two hundred square miles. These mines were opened about the year eighteen hundred and thirty, and were operated on a large scale but in a rude way, until the discovery of the California mines. Some thousands of laborers were at work here for a number of years and no doubt several millions of gold were obtained. Work is still carried on at a great many points and several thousands of dollars are annually mined. The deposits were originally very rich and yielded frequently ten dollars a day for each laborer. The gold bearing drift, or "gravel," is accumulated along the beds of the streams, on the benches of the hills and in all the various situations which have in California given rise to the division into river, hill, bench, flat and gulch diggings. Some of the deposits on the larger streams are quite extensive and of considerable depth. Many of them have been worked over several times. The processes heretofore employed were of the rudest kind, and no doubt the introduction of the improved California methods would render these mines again very profitable. Many of the hill and bench deposits have never been worked, and could not be, except by the hydraulic process.

The gold of these placers has evidently been derived from the numerous small veins in the slopes of the adjacent hills and mountains. The gangue of these veins is usually a granular white quartz (saccharoid). They are small and have not been mined hitherto. Machinery has been put up however near Brackettown for the purpose of working one of these saccharoidal veins, which seems to be nearly a foot in thickness. The third gold field referred to is in Caldwell County on Lower Creek. Operations have been carried on here on a considerable scale on both sides of the creek, but mostly on the north side, along the beds of the tributary streams which come down from the terminal spurs and ridges of the Warrior Mountains, which divide the waters of Lower Creek from John's River.

There are many other places where gold has been obtained from "gravel" in considerable amounts, as in the beds of some small streams on the slopes of the hills three to four miles west of Morganton, where gold washing is still carried on profitably; in the waters of Second Broad in Rutherford; on Pacolet River, Polk County, and in several parts of Cleveland and Lincoln.

The Shuford mine in the eastern part of Catawba, which contains both placers and veins, is situated on the King's Mountain belt. It has been worked for a number of years with very satisfactory results, and operations are to be resumed shortly. These are "dry diggings" and the difficulty is in procuring a supply of water.

Vein-mining has never been extensively carried on in this region. The Mountain Mining Company were erecting machinery during last summer to operate the quartz vein near Brackettown already mentioned, and were about to re-open a mine some four miles south of Shelby, which is neither a vein nor placer mine. The gold bearing rock is a heavy ledge of brown ferruginous mica-schist, which is impregnated with iron pyrites in a state of minute subdivision and abounds in garnets. There is no semblance of a vein proper. Dr. Em-

mons reports that gold is found in the conglomerates of Montgomery, and the very intelligent superintendent of the Rhodes mine in Lincoln assured me that he obtained gold from the common grey gneiss of the country, which constitutes the wall rock of that vein and at the King's Mountain mine in Gaston large quantities of limestone are stamped and washed. And I have seen gold-bearing *felspathic* slates from Moore and *talco-quartzose* slates from Montgomery, so that although the gangue rock of gold in this State is usually quartz, compact or saccharoidal, it is far from being universally so, nor is the occurrence of these auriferous rocks limited to *veins*.

There are two other mines in the piedmont section that are worthy of mention, the Baker (or Davis) and the Michaux, both on John's River near the Caldwell and Burke line. The latter has yielded some very fine capinet specimens, the veins being numerous, small and in places very rich. This mine has been scarcely opened, so that it is impossible to predict what will be its character economically. The veins are, so far, very much scattered and subdivided into threads, but a proper system of mining may develop their connection with a "mother vein," or their aggregation into a larger, regular, and well defined one. The country rock which carries these veins is granitoid gneiss, and is decomposed to considerable depths, into what the miners term "slate." The "Baker Mine" is situated a little higher up the river, near the mouth of Wilson's Creek. The vein here is situated in the plane of contact between a heavy bed of serpentine and the felspathic slates of the country. A large quartz vein meets this at right angles, which is also auriferous, and contains, near the outcrop, silver and lead; but it has been very little explored. Gold has been found at other points in this section, in small quantities, but the above mentioned are the only localities of much note. If we pass beyond the Piedmont Group into the King's Mountain Slates, there are many famous gold mines along this formation and in the gneissic rocks between it and the lower Catawba, several of which have been lately reopened under fa-

avorable auspices,—the King's Mountain mine, the Rhodes, Beattie, and two or three others. These are now operated by companies and under superintendents of California experience, in several cases, with the most improved California machinery manufactured in San Francisco. From these facts, and especially from the superior engineering skill which is now employed in these and several other such enterprises of the Mountain Mining Company, I infer that a new era is opening upon the mining interests of our State.

SILVER AND LEAD.

These two metals are associated in their ores in this State. There are but two or three localities in the territory under consideration which are worthy of remark in this respect. On the north slope of the Beech Mountain in Watauga County, on the waters of Watauga River, at two points galena has been lately discovered, which is rich in silver. The veins have been but little explored however, so that it cannot yet be determined whether they are of much value. One of the veins is in a greenish chlorito-argillaceous slate; the other I have not seen, but from hand specimens infer that it is associated with a large body of iron pyrites. A similar outcrop of galena was found a number of years ago at Flint Knob in Wilkes County. The ore is of good quality, containing both gold and silver; but no exposure of the vein has been effected, from which a reasonable conclusion can be drawn as to its extent or value. The ore, so far as exposed, is in a coarse slaty gneiss.

COPPER.

The most important deposits of copper ores are found, as already remarked, in the Buncombe Group. Besides the veins formerly described, in Jackson County, there is a similar group of valuable veins in Watauga, Ashe, and Alleghany. These veins occur, like the others, in the hornblendic rocks of

the series. The three most noted mines in this northwestern angle of the State, are the "Elk Knob," "Peach Bottom," and "Ore Knob." The first is one of the most promising outcrops of copper ore in the State. It is a large vein of the yellow sulphuret embedded in the most extensive body of hornblendic rocks in the State. The vein rock is a dark colored micaceous quartzite, nine or ten feet in thickness. It is situated on the northern slope of the mountain from which it is named, at an elevation of about four thousand feet.

There are many outcrops of gossan in this rugged region, some of which have been penetrated to a sufficient depth to reach the copper pyrites. This region is well worthy of the attention of the practical miner and capitalist. The Peach Bottom Mine is situated on the west side of the mountain range of that name in Alleghany and a few miles south of New River. This mine was well furnished with machinery for the elevation and concentration of the ore. It has been wrought to a depth of one hundred and fifty feet. The shafts and tunnels are now filled with water, so that I am not able to give the size, or other characters of the vein. It is embedded in grey gneissic slates and has the same strike and dip with them. The gangue is partly vitreous quartz, but chiefly a soft, coarse, quartzo-felspathic rock, very easily crushed. A portion of the vein yields also lead. Large quantities of ore were sent to the smelting works at Petersburg during the war.

"Ore Knob" is in the southeast corner of Ashe County, quite near the Blue Ridge. It is in the same character of rock formation as the last. It is said to have yielded several thousand tons of ore within a depth of sixty or seventy feet. The vein is said to be a large one. The ore is "yellow copper" as in the other mines. I have no doubt that all these mines could be profitably reopened but for the difficulty of transportation to market.

In the southern corner of Ashe County is another mine of some note, known as "Gap Creek." Having been opened

several years before the war, the shaft is of course filled up so as to prevent any examination. Dr. Emmons visited it when first opened and reports that at a "depth of fifty to sixty feet the ore is vitreous, which will probably be twice as rich as the "yellow sulphuret." He further describes the vein as "a true vein, having a perfect regularity in direction as well as in its walls." "The width is variable, being eighteen inches wide at the surface, and from twelve to twenty-four inches at different depths." "The rock in which it is embraced is a horn-blende slate about a quarter of a mile wide."

There are indications of copper veins in many other localities in this County, and doubtless many new mines will be opened as soon as this region shall be furnished with means of transportation.

IRON.

The remarkable deposits of magnetic ore in Mitchell have been previously described. The Cranberry is the most important and extensive, but there are many other beds in different parts of the County, some of them magnetic as at Flat Rock, others hematitic. In Madison, there is also a promising outcrop of slaty magnetic ore on East Fork of Laurel, and another near Jewell Hill of specular ore. In Ashe County, on the North Fork of New River, are also large deposits of valuable ore, generally magnetic, some of which, smelted in a common bloomery, are said to have yielded a fine quality of iron. In the Linville Slates, besides the hematitic beds formerly mentioned as occurring with the limestone in Transylvania and Henderson, there are several others of the same character in McDowell, in the spurs of Linville Mountain, on both sides of the North Fork of Catawba. Iron was made here many years ago, but the quality seems not to have been good. There is a bed of magnetic ore near Patterson, in Caldwell, which I take to be of fine quality, but there is no exposure to justify an opinion as to its quantity. Both mag-

netic and hematitic ores are reported to be found in the Brushy Mountains in Caldwell and Wilkes, and to have been formerly manufactured into iron at a few points. The most valuable bed of iron ore in the Piedmont Group is found in the syenitic belt near Newton in Catawba County. The ore is of the same quality as that at Cranberry, and yields a similar iron.

The extensive and very valuable iron beds of Gaston, Lincoln and Catawba, which have been wrought for three quarters of a century and have yielded more iron than all other mines in the State, do not belong to the formation under consideration. They occur in the King's Mountain Slates, from the South Carolina line to Mt. Anderson, cropping out at short intervals along the whole distance of some forty miles. An account of some of the most important of these beds is given by Dr. Emmons in the report for the year eighteen hundred and fifty-six. Several new mines however, were opened during the late war in the vicinity of Mt. Anderson, and several new furnaces were erected, which are still in blast. The ore is partly magnetic, and partly of the variety known as Itabirite, and the iron generally of very good quality.

CHROMIC IRON.

As has been stated previously, this mineral accompanies the serpentine in the most of its out crops in the transmontane plateau, e. g., in Yancey, Mitchell and Watauga, as well as in Jackson. It exists in the form of nodules and veins.

BARYTES.

There are several veins of this mineral in Madison County.

GRAPHITE.

There are a few small veins of graphite, or plumbago in Cleveland and Catawba, in the gneissic rocks, but the most considerable and the largest number also of them are found in the King's Mountain Slates in Catawba, Lincoln and Gaston.

MICA.

Large crystals of mica are found in many parts of Yancey and Mitchell; the largest I have seen however, were obtained in Cleveland near Shelby. When clear and free from flaws, plates four inches by six are worth about one dollar and a-half per pound.

PYRITES.

Iron pyrites is found in numerous localities, but the most extensive and important occurrence of it is that which has been already mentioned in Cleveland and Rutherford. The gneissic slates of a large district here on the waters of First and Second Broad and Sandy Run, are impregnated with this mineral in a state of very minute subdivision. The rock weathers easily on exposure to the air, and produces copperas and alum in immense quantities. Thousands of tons were manufactured here during the war, and the business might be conducted profitably still. The circumstances under which copperas is manufactured in Vermont and elsewhere are not more favorable. The only disadvantage here is in the matter of transportation to market, which however is likely to be soon remedied.

MINERAL SPRINGS.

The same cause, viz: the abundance and wide diffusion of iron pyrites give rise to so many sulphur, chalybeate and alum

springs in this Piedmont country. They abound throughout the region, but the most noted are Wilson's Springs, (White and Red Sulphur, and Chalybeate) near Shelby in Cleveland County, McBrier's and Patterson's in the same County, and the Catawba White Sulphur and Chalybeate in the northern part of the County of the same name, and Piedmont Springs in Burke near Table Rock. All these are watering places of some celebrity. Wilson's and the Catawba have been recently improved and furnished in good style. They have the advantage of being located in a very salubrious climate, in view of the mountains, and easily accessible from the Rail Roads. Beyond the Blue Ridge also mineral springs abound. The most notable are the celebrated Warm Springs on the French Broad in Madison, the Sulphur Springs near Ashville, and the Million Springs at the foot of Craggy Mountain.

GRINDSTONES AND WHETSTONES.

The Linville Slates furnish abundant materials for grindstones and whetstones, in the Linville mountains, and for whetstones of very good quality in Adam's Knob on John's River. On Laurel River in Madison is a peculiar cherty splintered whitish quartz rock which Mr. George Gehagan was manufactured into millstones which are described as nearly equal in performance to the French buhrstone.

BUILDING STONES.

In a granitic country like this, building material is too abundant to require particular mention.

SERPENTINE.

This rock has been mentioned as occurring frequently in the transmontane region; but it is not of a quality to be valuable for ornamental purposes. There is in fact only one local-

ity where it has the proper structure and fineness of grain, and that is near Patterson in the upper Yadkin Valley. Here it is of a dark blue color and beautifully veined with chrysotile, and furnishes an excellent material for mantels, table-tops and numerous other ornamental uses.

LIMESTONE.

This is the most valuable mineral found in the territory under review. Little account is made of it hitherto, because of the backward state of the agriculture of the region. But the time is not distant when our farmers will understand that lime is an absolute necessity in all profitable and intelligent cultivation of the soil. The completion of our system of internal improvements is demanded for no other purpose so immediately, or so urgently as for this, of furnishing facilities for the general distribution of this and other fertilizers. Limestone is not abundant in North Carolina. And the deficiency can only be supplied by multiplying the means for as wide distribution of it as possible from the few localities which furnish it.

It has been mentioned already that there are three principal formations in the western part of the State in which this rock is found, the Cherokee, the Linville and the King's Mountain Slates; and the general course of these belts has been traced with some particularity, and the localities indicated where the limestone outcrops were observed. It is found also in the Buncombe Group, in two beds which cross the French Broad near the town of Marshall, as has been mentioned formerly.

AGRICULTURAL GEOLOGY.

The general agricultural features of this region will be readily inferred from what has been stated above in description of its topography and lithology, the soils of a country being the immediate derivatives of its rock-formations and

owing their character entirely to these. As a general statement, wherever mica schists prevail, the soil is sterile and the forests inferior, as in the southern part of Polk and Cleveland and portions of Burke, Catawba and Caldwell. The same remarks are applicable to the soils which are derived from sandstones, as on Linville Mountains, and about Paint Rock. But as the soils of much the larger part of the territory under consideration, (probably nine-tenths of it,) are derived from gneissoid rocks, their value and character will in any case be determined by the composition and quality of these. Where the rock is highly felspathic, the soil is thin and the timber poor; but it is generally very improvable, requiring only the addition of lime to render it productive. The most notable illustration of both these points is furnished by the Henderson County belt of gneiss, through its whole extent, from Transylvania to McDowell. The productive power of these soils along the French Broad, has been trebled in a few years by the liberal use of lime.

Where the gneissic rock becomes hornblendic an immediate improvement is observable in the soil. Illustrations of this sudden change in the character of the soil, coincident with an alteration in the composition of the rocks are numerous. These dark hornblendic rocks always produce a red, or "mulatto" soil. The hornblende slates of Tryon Mountain may be cited as an example in immediate and striking contrast with the poor felspathic soils a little west of it. Another notable illustration is furnished by the syenitic belt in which Newton is situated. But the most conspicuous demonstration of the immediate relation of the soil to the subjacent rock is found in the massive hornblendic mountains already described along our northwest border, in Mitchell and Watauga, the Yellow Mountains, Rich Mountains, Elk Knob &c.

Of course the best soils of this region, as elsewhere, are the alluvions on the water courses,—the "bottoms." In a mountainous country these river bottoms are usually narrow and interrupted. But there are some remarkable exceptions in this

region, the most important of which are the valleys of Upper French Broad, Catawba and Yadkin, in all which are very extensive tracts of several thousand acres of the finest farming land. And similar tracts are found on the rivers further west, Pigeon, Tennessee and especially Valley River.

CHAPTER III.

MISCELLANEOUS.

Climate.—The general remarks on the climate and productions of the more western Counties contained in the former report (pages forty-one et seq.) are equally applicable to the whole transmontane plateau. The most elevated portion of it, in Mitchell and Watauga, (above three thousand feet) has the summer temperature of New York, seventy-two degrees; and the winter temperature of Washington City, thirty-five degrees; mean annual, fifty-six degrees. The annual rainfall is likewise that of New York, forty-two inches; that of the eastern section of the State being forty-five. Snow falls here about as often as in New York, but not more than half as deep. On the lower plateaus, as the French Broad, the elevation of which is a little below two thousand feet, the winter climate is proportionably milder.

Timber.—The forests of this mountain plateau are very heavy, and contain an incalculable amount of valuable timber. There are hundreds of square miles of white oak forests, which must become immensely valuable for export at no very distant day. The black locust covers large tracts of territory in many of these Counties. This is the most durable timber in our forests, and is so much esteemed for ship building that it is cultivated in the northern States on a large scale, one acre on Long Island, for example, being valued at two to four hundred dollars. Chestnut timber is everywhere. Poplar (tulip tree) is abundant. These two are the largest growth of the mountain forests, sometimes measuring ten to

twelve feet in diameter. Not far behind these in size is the black oak (water oak of the mountaineer.) White pine abounds in all the higher plateaus, *e. g.*, on upper Linville, Elk and New River, (South Fork,) and often reaches a height of one hundred and fifty feet and a diameter four to five feet. Hemlock is also very abundant along the streams in the higher regions, and attains a great size. Among valuable cabinet timbers, mountain birch, (mahogany of the mountaineer,) birds-eye maple, black walnut and cherry are found in great quantities, and of large size. Large fields have been fenced with black walnut in this region. I measured a cherry tree in Elk bottom, which is more than nine feet in girth, and seventy-five feet to the first limb. Such a tree would be worth more than one hundred dollars in New York. There are also extensive forests of sugar maple, from which many thousands of pounds of sugar are manufactured every year, supplying the entire home market in many sections. The linn tree, (*tilia*,) which is abundant in the rich coves, is highly prized by the inhabitants, as furnishing a valuable winter forage for cattle.

Besides timber there are other spontaneous products that are worthy of mention ; among which are

Cranberries.—There are hundreds of acres of native cranberry beds on the streams in the higher valleys, from which large quantities of fruit are annually gathered for export. To which may be added

Medicinal herbs.—Of these ginseng is the most important. Several hundred thousand pounds of this article are annually exported, and it is a source of large revenue to the inhabitants. North Carolina and Minnesota are the principal sources of this export, the whole of which goes to China. Wild ginger (*asarum*) is also an article of considerable trade, as well as several kinds of snake root, pink root, puccoon, hellebore, lady's slipper, spikenard, Indian turnip, Indian hemp, and a hundred others. The aggregate amount of mo-

ney realized annually from the trade in these articles in the mountain section of this State is probably over a quarter of a million.

The principal farm products are corn, wheat, rye, buckwheat, oats, grasses, (chiefly timothy, herd, blue, orchard and clover), fruits, (especially apples, occasionally peaches, pears and grapes,) potatoes, and root crops.

Corn grows everywhere. On the higher ridges and plateaus (three thousand feet and upwards) the northern varieties are required on account of the shortness of the seasons.

Wheat does well in Buncombe, Madison, Yancey, and in small portions of the other Counties.

Rye, buckwheat, oats and the grasses flourish everywhere, but especially in the more elevated regions of Mitchell, Watauga, Ashe, Yancey, &c. I am assured by intelligent farmers in this region that four tons per acre of hay is no uncommon yield. These grasses escape from cultivation and propagate themselves everywhere. I have seen a field near five thousand feet high that was seeded, some twenty years ago, with timothy, and has not been under fence in fifteen years, which has still a good "set" of grass. Oats grown at this place weighed forty-two pounds per bushel.

In the higher parts of the mountains, (above four thousand five hundred feet,) there are three species of perennial winter grass, which send up their new shoots, or stools, in November, and remain green all the year; so that cattle and sheep require little care even in winter, except in case of a deep fall of snow, which does not happen more than once in eight or ten years.

The new Japan clover, as it is called, (*Lespedeza striata*) has spread over the whole of this region. I have found it in a few cases on the tops of mountains four to five thousand feet high. Such facts as these, taken in connection with the exceed-

ing cheapness of land, (twenty-five cents to one dollar per acre,) and the proximity to the great markets of the country, will surely justify the opinion that the continent does not afford more favorable conditions for profitable cattle farming, wool-growing and cheese making.

The President of the Cheese Makers' Association of New York (Gov. Seymour) stated the other day in an address that the reason of their ability to compete successfully with the English cheese makers is to be found in the comparative *cheapness of land* in New York. The price of one acre of Governor Seymour's grass land will buy two or three hundred acres in this region.

Cheesemaking has recently been introduced here by a few intelligent and enterprising citizens of Buncombe and will no doubt soon establish itself as a leading industry of the mountain section.

It is inexplicable that no one has undertaken wool-growing on a large scale, as such an enterprise, judiciously conducted, could scarcely fail of success.

Apples.—Fruit growing must also prove very profitable, now that transportation is to be furnished. No part of the continent produces the apple in greater perfection, or with less cost and trouble. There is scarcely a county that has not several *accidental* seedlings of fine quality; and apples are frequently produced of twenty-two to twenty-three ounces weight: (and even much larger figures were reported to me, but as I had no means of verifying the statements, I do not venture to repeat them.)

Potatoes here are remarkably prolific, the yield being sometimes as high as six hundred bushels to the acre, and the quality unsurpassed.

Root Crops are abundant and of the best quality,—a fact worthy of note in connection with the subject of cattle raising.

The climate and agricultural characteristics of the piedmont region are notably different. In these respects it much more nearly resembles the middle section of the State, (the hill country.) Corn and wheat are of course the staple products, and near the mountains, rye, &c. A large part of it is well adapted to the growth of tobacco, a plant not much cultivated here however. Fruits grow well every where, but particular localities have special adaptation to the growth of certain species. The apple flourishes especially along the foot of the Blue Ridge. On the Brushy Mountains also, in Wilkes County a fruit is produced of peculiar excellence. Both its orchards and vineyards are famous. Lincoln County originated the grape of that name, (called also the "Hart," "Lenoir" and "Davis" grape,) and Buncombe claims the Catawba. Cherry Mountain in Rutherford is noted for its extensive cherry orchards and the unequalled flavor of the fruit. It also produces a rare quality of wheat. The Japan clover has taken possession of this whole piedmont section within a few years, occupying the road sides, fence corners and old fields, and seems likely to exterminate the pestiferous broom grass. This plant is an annual, of comparatively recent introduction, which seems destined to play an important role in the future agriculture of the State. Notwithstanding the differences of opinion among farmers in the regions which it has invaded, it is unquestionable that it has valuable qualities both for pasturage and as an improver of the soil.

Water power is abundant every where, as will be evident from the topography of the country already given in outline, taken in connection with the annual rainfall of forty-two to forty-four inches. The Catawba and Yadkin descend seven hundred feet in a course of sixty miles across the piedmont section from the base of the Blue Ridge: and the thousand tributaries (many of which are themselves respectable rivers) have a much more rapid descent. Beyond the Blue Ridge

the case is still stronger. Here is a score of large rivers which precipitate their vast volumes of water from these elevated plateaus through more than a thousand feet of descent in a course of thirty to forty miles, developing an amount of force which is beyond all estimate. The power developed by the Falls of Niagara is estimated to be thirty times as great as the whole amount of utilized water and steam power of Great Britain. The water power of North Carolina is ample for a continent.

Change of Climate.—It has been long known that there is a certain established relation between forests and climate, such that a change in one inevitably affects the other. The amount of rainfall, the humidity and the electrical state of the atmosphere of a region depend immediately upon the extent of its forests. This is so well understood that in some of the prairie States, as well as in various countries of Europe and in Egypt, systematic efforts have been made (not without success) to meliorate the aridity of the climate by the encouragement of forest cultivation by statutory enactments and by the direct interference and agency of government.

Although there is a vast amount of forest surface in the mountain region, the destruction of so considerable bodies along the valleys and slopes of some of the plateaus has already begun to tell upon the climate. Of this there are several indications. The streams in some sections have notably contracted their usual volume, while they are more subject to excessive floods than formerly. The forest fruits—the mast of the oaks, beech and especially the chestnut,—have become much more precarious and uncertain. The leaves of the chestnut tree show indications of change and disease. And in the piedmont this tree has perished within the last generation, except on the higher spurs and slopes of the mountains. I was informed by the oldest settlers that in localities where buckwheat yielded thirty bushels to the acre a generation ago, not more than half that product can be obtained from the same

class of land. And so of other crops. On the other hand, in several Counties in which wheat could not be profitably cultivated a decade or two ago, it has now become a principal crop.

Our people have carried their method of farming, (which consists chiefly in the manufacture of "old fields,") beyond the Blue Ridge, and already these glorious mountain landscapes have been extensively marred and scarred by large tracts of these favorite mementoes of our agriculture (ehen!)—North Carolina Farmer, His Mark. Some of the finest lands on the continent utterly denuded of forest, and of soil in half a dozen years, and reduced to bare rocky cliffs and stone heaps and steep glaring gullies,—a monument, a beacon and a frowning curse! No wonder these bald declivities, thus plundered and outraged, send down their destroying floods to ravage the plains. Nature will be avenged on man some way.

I am for levying a special tax on all "old fields," as heavy as the Constitution will permit. Indeed they ought to revert and to be declared *ipso facto* forfeit to the State. He who takes an acre of virgin soil which the Almighty has employed all the forces of his universe some thousands of years to embellish and enrich, his sun and rain and frost and successive tribes of animals and plants and chemistry of the stars, to make it "a thing of beauty and a joy forever" for the use and enjoyment of his children—he who takes *that* and converts it into a blight and a devastation in the shape of an *old field*,—what is he but a criminal? No man, no generation of men has an absolute title to the soil in any such sense that he may innocently destroy it. It belongs to mankind, and the reversionary right of posterity to it is indefeasible and inalienable, and no individual or generation has, or can acquire any other than a usufructuary property in it. He who creates an "old field," therefore, and so "makes a desolation" worse than even war can effect, perpetrate a robbery upon mankind, commits a grand larceny against his own children, "an iniquity to be punished by the judges."

Antiquities.—This is a subject to which almost no attention has been given in our latitude, and which would be considered by most as very unpromising. But I risk nothing in saying that there is here a wide and inviting field for the antiquarian. From the Indian Oyster banks and Mussel beds, the kitchen middens, of the Albemarle Country to the huge burial mounds of Macon and Cherokee, there are mementoes of the aboriginal races in almost every County. Recent freshets in the Catawba, the Yadkin and the Dan have exhumed from the soil of the level “bottoms,” (the favorite cemeteries of the Indian,) thousands of relics of curious interest, skeletons, burial urns, various implements and utensils of stone, pottery and *copper*, and weapons and personal ornaments. But a more remarkable fact is the existence of ancient mines in different parts of the mountain region, to the date and origin and purpose of which history gives no clue. Two of these are worthy of special mention, one in Cherokee, the other in Mitchell. The former, on Valley River, consists of a vertical shaft about one hundred feet deep, regularly timbered in a workmanlike manner, and a tunnel driven in to meet it from the foot of the hill at a distance of several hundred yards (this last point I did not verify by personal observation.) The shaft was evidently sunk with a view to strike a heavy quartz vein near it, containing hematitic iron. From this shaft were obtained chestnut shingles of a former roof, and an iron crank. Who are the authors? The “oldest inhabitants” can give no account of it. And they could learn nothing from the Indians. Not the Indians themselves certainly, for they did not know the use of iron, nor understand mining, or smelting of metals. Every one suggests *DeSoto*; but according to the best accounts, he did not stop to mine and even had no implements for the purpose, and moreover did not touch the territory of North Carolina. There must have been other similar Spanish expeditions of which no account has been preserved.

The other locality is near Bakersville, Mitchell County. The work here is of a different and ruder character. There

are a dozen or more open pits, forty to fifty feet wide by seventy-five to one hundred long, and filled up to fifteen or twenty feet of depth, disposed along the sloping crest of a long terminal ridge or spur of a neighboring mountain. The excavated earth was piled in huge heaps about the margin of the pits, and the whole is overgrown with the heaviest forest trees, oak and chestnut, some of them three feet in diameter, and some of the largest belonging to a former generation of forest growth, fallen and decayed; facts which indicate a minimum of about three hundred years. There is no appearance of a mineral vein and no clue to the object of these extensive works, unless it was to obtain the large plates of mica, or crystals of kyanite, both of which abound in the coarse granite rock. Or, as is more probable, they may have been dug ignorantly and vainly in the hope of finding something which had no existence, as in the case of so many later minings for copper and silver in the same region.

the history of the world, from the beginning of time to the present day, is a subject of great interest and importance. It is a subject which has attracted the attention of many of the greatest minds of all ages, and which has been the subject of many of the most important works of literature and science. The history of the world is a subject which is of great interest to all of us, and which is of great importance to the human race. It is a subject which has attracted the attention of many of the greatest minds of all ages, and which has been the subject of many of the most important works of literature and science. The history of the world is a subject which is of great interest to all of us, and which is of great importance to the human race.





